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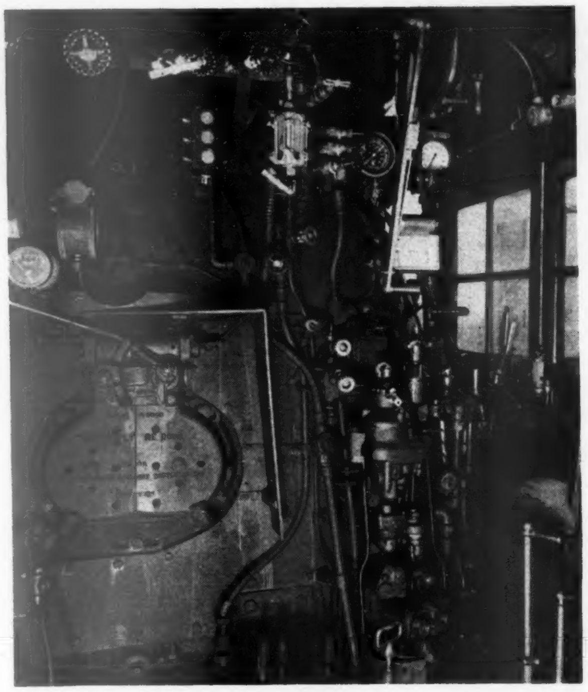

See page 216

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Volume 114 *No. 6*

Car:

Locomotive:

Editorials:

Backshop and Enginehouse:

Car Foremen and Inspectors:

The Reader's Page:

Overhead Icing in

C. N. Refrigerator Cars

Cars built by railroad have a steel superstructure with eight overhead ice tanks and are equipped with underslung heater and device indicating inside temperatures — Tests demonstrate desirable characteristics of these cars

For several years the Canadian National has been experimenting with refrigerator cars having overhead ice tanks. After building and testing various designs of refrigerator cars of this type, it was decided that cars with continuous baffles or drip pans under the tanks which connect up with side flues and having tanks that retain half the meltage were the most desirable.

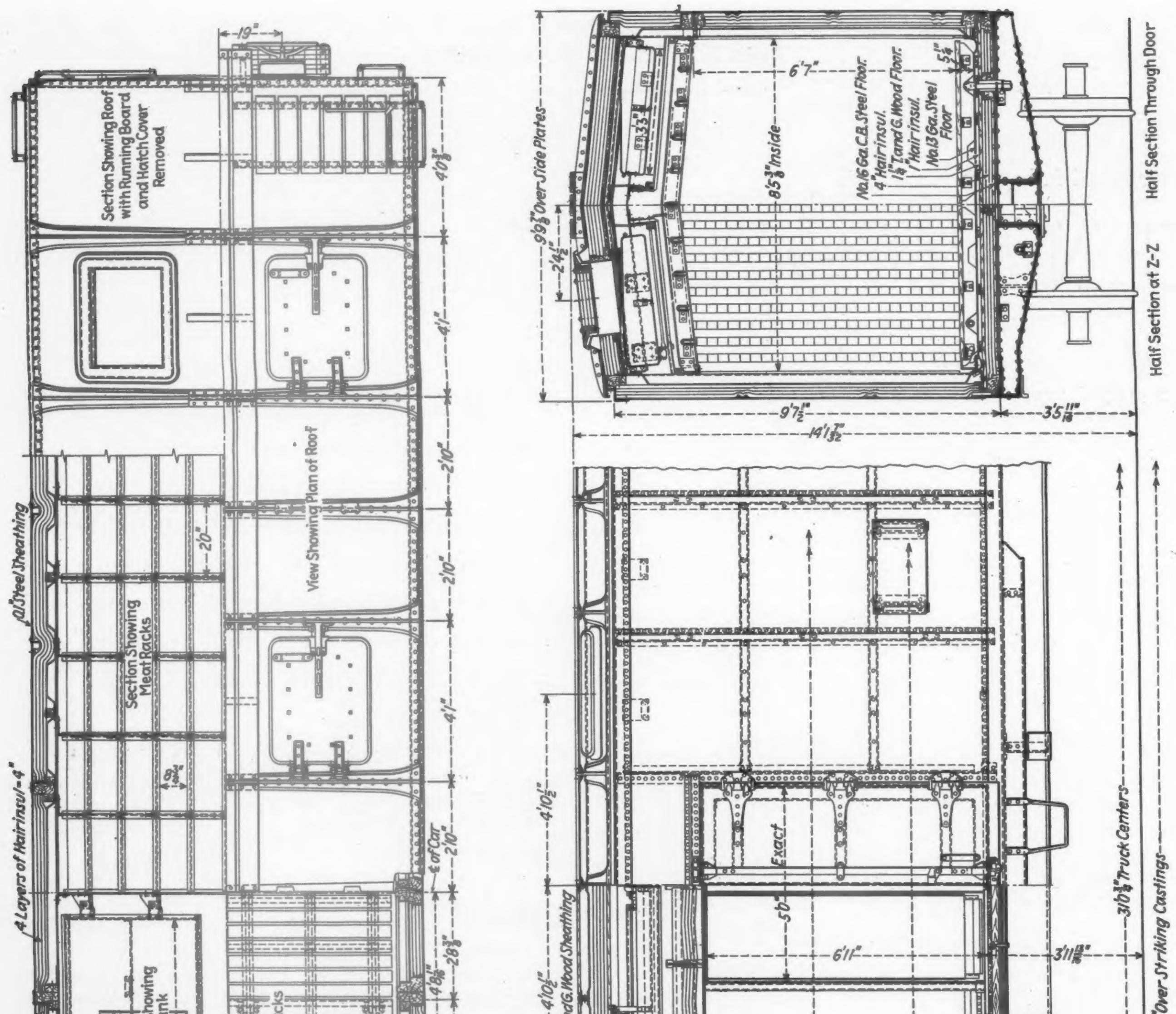
As a result of this experimental work, the Canadian National has built 100 refrigerator cars with overhead ice tanks at its Transcona, Manitoba, shops, the first of which was completed in October, 1939. These cars have eight overhead tanks with a total capacity of 6,500 lb. of crushed ice, continuous baffles, and metal side flues through which the meltage and cold air descends. They have a steel superstructure with an inside wood lining, metal sub-floors and a metal inside floor, cadmium plated. They are equipped with underslung charcoal heaters having manually operated draft controls. The temperatures inside the car at the top and bottom of the doorway are indicated by Liquidometers, the dials of which are mounted on the outside of the car near the doorway, making it possible to check the inside temperatures enroute.

The cars are equipped with underframes of A. A. R. design and Barber stabilized trucks having Dalman cast-steel side frames. They have an inside length of 40 ft., an inside width of 8 ft. $5\frac{3}{8}$ in. and an inside height between the top of the floor racks and the bottom of the meat racks of 6 ft. 7 in. The cars have a weight capacity of 65,000 lb., a cubic capacity of 2,216 cu. ft. and a light weight of 70,200 lb.

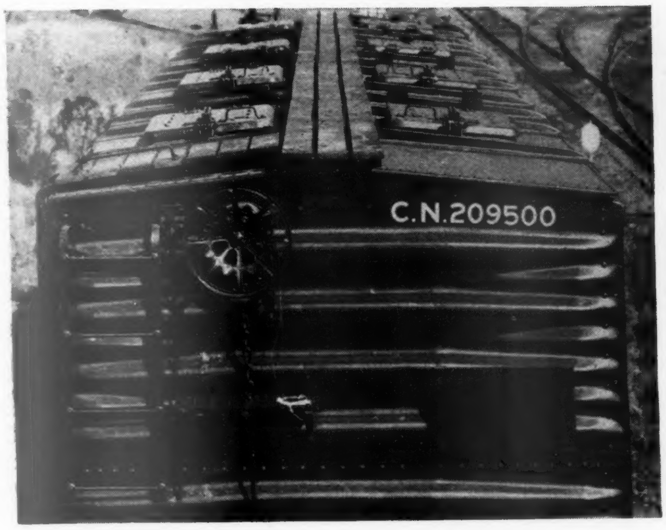
The Superstructure

The superstructure is of steel instead of wood as commonly employed in refrigerator cars. The side posts are special pressings, $2\frac{1}{2}$ in. by $2\frac{3}{8}$ in., and the Z-section side plates are $4\frac{3}{8}$ in. by $3\frac{3}{8}$ in. by $2\frac{1}{2}$ in. A W-section

The Canadian National refrigerator cars have a steel super-structure—The dials indicating inside temperatures may be seen mounted near the doorway



Elevation and cross-sections of the Canadian National refrigerator cars with overhead ice tanks



The roof arrangement with four hatches on each side of the running board

corner-post construction is used and Dreadnaught steel ends have been applied. The outside sheathing is of .10-in. plate with the plate offset at the lapped joints which are made water tight by the application of a layer of asbestos felt. Copper-bearing steel is used for plates and pressings under ½ in. in thickness. The cars are equipped with the Murphy all-steel riveted type roof with which are combined the hatch frames.

The inside steel framing consists of an inside side sill of 3-in. by 3-in. by ¼-in. angles, an inside side plate, 8 in. by 3/16 in., and Z-section side posts, 1 3/16 in. by 3 in. by 2 3/16 in., to which are bolted 2⅞-in. by 2½-in. sub side posts of fir. The ceiling carlines are 2½-in. U-shaped pressings of ⅛-in. steel to which are bolted 2¼-in. by 1½-in. furrings. A wood ceiling of 13/16-in. by 3¼-in. fir is applied longitudinally, nailed to the carline furrings. The hatch frames are of 5/32-in. pressed steel and are welded to the roof sheets and to the hatch carlines. The combination hatch covers and plugs are built up of wood and steel and are equipped with Equipco hatch closure fittings. The edge seal consists of hair insulation covered with canvas while the top seal is made of sponge rubber cemented to the hatch frame.

The ice tanks are suspended below the ceiling by pressed brackets riveted to channel-shaped pressings of ⅛-in. open-hearth steel, 5 in. deep, running crosswise of the car. The tanks have an inside length of 8 ft. 6 in., an inside width of 3 ft. 3 in. and are made in two pieces of No. 13 gage open-hearth steel bolted together by 5/16-in. cadmium-plated bolts. There are six 1-in. drain holes on the inside vertical wall of the tanks and a special brass valve at the bottom to permit the drainage of the brine from the tanks. A galvanized wire netting is applied between the top of the tank and the under side of the hatch frame.

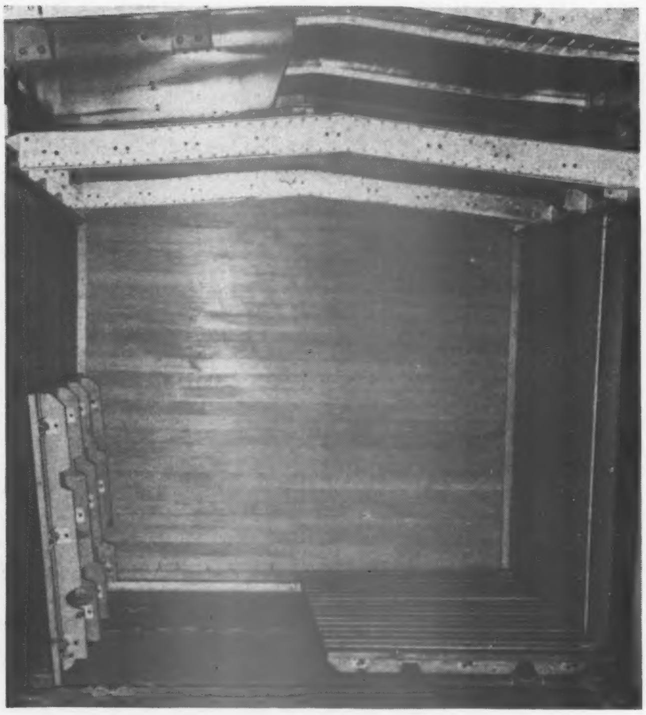
The continuous baffles or drain pans under the tanks are built up of No. 22 gage open-hearth steel, wood furrings, and five-ply ⅝-in. plywood panels. They are supported at the center of the car by brackets fastened to the ceiling carlines and to the tank-support channels and at the sides of the car by brackets fastened to the meat-rack supporting angles. A removable pan is installed under the brine drain valve on the outside edge of each tank. Both the ice tanks and the drain pans have a Promat finish which is a flexible vitreous enamel baked on to the steel, giving to them a porcelain-like rustproof surface. Underneath the drain pans are nine white oak meat racks running the length of the car which are supported by 19 meat rack carriers made of ⅛-in. channels.

The air ducts through which the cold air circulates downward at the sides of the cars consist of steel pans and covers of No. 22 gage open-hearth steel with a Promat finish. The ducts are fastened to the steel floor and inside side plates by stainless steel screws and to the inside wood posts by cadmium-plated wood screws.

Principal Dimensions and Data on the Canadian National Refrigerator Cars with Overhead Ice Tanks

Length over strikers, ft.-in.	41—11¾
Length inside, ft.-in.	40— 0
Length, center to center of trucks, ft.-in.	31— ¾
Width over side plates, ft.-in.	9— 9⅞
Width, inside, ft.-in.	8— 5⅜
Height, inside, ft.-in.	6— 7
Height, rail to top of running board, ft.-in.	14— 1 7/32
Ice capacity, lb.	6,500
Capacity, cu. ft.	2,216
Capacity, lb.	65,000
Light weight, lb.	70,200

The ice tanks are supported by channels running cross-wise of the car—The metal air ducts through which the meltage and cold air descend are in place along the side of the car



One of the hinged floor racks is raised to show the cadmium-plated metal floor laid in sections with a waterproof compound in the seams

Over the duct covers is a ⅝-in. plywood lining with the panels extending from the top of the floor rack to the under side of the meat-rack supporting angles and from center to center of the inside wood posts to which they are fastened by galvanized wood screws.

A deafening floor of No. 16 gage copper-bearing steel is riveted to the underframe. Above the deafening floor is a wood floor supported by sub side sills of 6-in. by $3\frac{5}{16}$-in. fir and by a 2-in. by 4-in. wood stringer at the center.

A departure from the usual construction of refrigerator car floors is the application of a steel floor, cadmium plated, over the wood floor. It is of ⅛-in. steel made in sections bolted together with the seams filled with a water-proof compound. The outside edges of the sections are shaped to form a continuous gutter at each side of the car connecting up with drain traps at the corners. This floor is held to the inside side sill by brackets but is not fastened to the six 1⅛-in. by 3-in. wood stringers running the full length of the car which support the floor between the sides.

The cars are equipped with hinged floor racks, the supports for the hinges and the heater coils being welded to the steel floor. The side doors have a steel frame with outside sheeting of 0.10-in. copper-bearing steel pressed to shape, and are hung by three self-locking hinges. The doors are equipped with ducts and lining similar to that applied to the body of the car.

Insulation

The cars are insulated by layers of Hairinsul in the sides, floors, and roofs. To the inside of the sheathing is applied four layers of 1-in. insulation, each layer extending from side sill to side plate and from door post

Partial List of Materia's and Ec uipment on the Canadian National Refrigerator Cars with Overhead Ice Tanks

Truck, stabilized	Consolidated Equipment Co.
Truck frame and bolster	International Equipment Co.
Journal box lids	Holden Co., Ltd.
Dust Guards	International Equipment Co.
Draft gear	Canadian Appliance Co.
Coupler centering device	Standard Railway Equipment Mfg. Co.
Couplers, coupler yokes	Canadian Steel Foundries Dominion Foundry & Steel
Air brake equipment	Canadian Westinghouse Co.
Brake hangers, brake lever connections	International Equipment Co.
Brake mast platform	Consolidated Equipment Co.
Brake beam supports	Buffalo Brake Beam Co.
Hand brake	Holden Co., Ltd.
Foof, hatches	Standard Railway Equipment Mfg. Co.
Hatch closure	Consolidated Equipment Co.
Hatch seal	Dunlop Rubber Company, Ltd.
Steel ends	Standard Railway Equipment Mfg. Co.
Insulation supports and spacers	Canadian Appliance Co.
Insulation, roof, sides, and floors	American Hair and Felt Co.
Door frame	Consolidated Equipment Co.
Door fasteners	W. H. Miner, Inc.
Door hinges	Union Railway Equipment Co.
Door insulation	Canadian Appliance Co.
Floor, steel; floor rack hinges; floor rack supports	Consolidated Equipment Co.
Threshold plates; insulation	Johns-Manville Co., Ltd.
Defect card holders	Holden Co., Ltd.
Heaters	The Robert Mitchell Co., Ltd.
Tanks, ice; drip pan; ducts	Standard Railway Equipment Mfg. Co.
Drain traps	Union Railway Equipment Co.
Temperature recorders	W. K. Davidson Co.
Drain valve	Crane Co.
Sylvaply fir panels	H. R. MacMillan Export, Ltd.
Phemaloid	Railway Power & Engineering Corp.
Promat finish	Holden Co., Ltd.

The finished interior—Plywood is used for the inside lining of the side walls—The inside height between the top of the floor racks and the bottom of the meat racks is 6 ft. 7 in.

Comparison of Temperatures in an Experimental Canadian National Overhead Ice Car and a Conventional End-Bunker Car, Both Loaded with Bananas, New Orleans, La. to Omaha, Neb.

Station	Time	Date, 1939	Outside temp., deg. F.	Average temp., deg. F. Top	Average temp., deg. F. Bottom	Temp. Spread, deg. F.	Max. Temp. deg. F.	Min. Temp. deg. F.	Temp. Spread deg. F.
Canadian National 207902									
New Orleans, La. (after loading)	11:45 a.m.	Aug. 25	87	79.20	78.6	.60	80	77.5	2.5
New Orleans, La. (at ice house)	2:40 p.m.	Aug. 25	91	78.75	78.0	.75	79.5	77.0	2.5
McComb, Miss.	7:35 p.m.	Aug. 25	80	74.80	73.0	1.80	76.7	69.7	7.0
Jackson, Miss.	10:00 p.m.	Aug. 25	75	72.30	70.4	1.90	75.0	67.5	7.5
Memphis, Tenn.	8:45 a.m.	Aug. 26	85	63.90	59.4	4.50	67.2	56.0	11.2
Fulton, Ky.	2:30 p.m.	Aug. 26	94	60.40	55.5	4.90	63.3	52.8	10.5
Bluford, Ill.	9:15 p.m.	Aug. 26	68	58.40	55.1	3.30	60.2	53.0	7.2
Effingham, Ill.	1:05 a.m.	Aug. 27	62	57.30	55.0	2.30	59.2	52.0	7.0
Champaign, Ill.	3:40 a.m.	Aug. 27	56	56.60	54.9	1.70	58.3	51.0	7.2
Chicago	8:30 a.m.	Aug. 27	77	55.90	54.7	1.20	57.3	50.8	6.5
Hart, Ill.	1:30 p.m.	Aug. 27	80	56.30	54.8	1.50	57.3	52.0	5.3
Freeport, Ill.	2:40 p.m.	Aug. 27	88	56.40	54.9	1.50	57.5	52.2	5.3
Dubuque, Ia.	8:00 p.m.	Aug. 27	68	57.60	55.6	2.00	58.5	53.7	4.8
Fort Dodge, Ia.	3:40 a.m.	Aug. 28	59	59.40	57.4	2.00	60.0	56.0	4.0
Omaha, Neb.	9:00 a.m.	Aug. 28	76	59.80	58.4	1.40	60.2	57.0	3.2
Illinois Central 50286									
New Orleans, La. (after loading)	11:50 a.m.	Aug. 25	87	79.80	78.2	1.60	81.5	77.0	4.5
New Orleans, La. (before icing)	2:40 p.m.	Aug. 25	91	80.30	78.2	2.10	81.5	77.5	4.0
McComb, Miss.	7:35 p.m.	Aug. 25	80	75.90	64.2	11.70	76.7	58.5	18.2
Jackson, Miss.	10:00 p.m.	Aug. 25	75	73.30	58.1	15.20	74.7	54.0	20.7
Memphis, Tenn.	8:45 a.m.	Aug. 26	85	62.20	47.8	14.40	64.0	47.5	16.5
Dyersburg, Tenn.	1:15 p.m.	Aug. 26	94	60.70	46.0	14.10	62.2	44.2	18.0
Fulton, Ky.	2:30 p.m.	Aug. 26	94	60.30	46.5	13.80	61.5	44.0	17.5
Bluford, Ill.	9:15 p.m.	Aug. 26	68	58.60	46.6	12.00	59.8	45.0	14.8
Effingham, Ill.	1:00 a.m.	Aug. 27	62	57.20	47.8	9.40	58.8	45.5	13.3
Champaign, Ill.	3:40 a.m.	Aug. 27	56	55.90	48.7	7.20	57.1	46.5	10.6
Chicago	8:30 a.m.	Aug. 27	77	55.90	49.1	6.80	57.2	48.0	9.2
Hart, Ill.	1:30 p.m.	Aug. 27	80	57.80	50.0	7.80	59.0	48.8	10.2
Freeport, Ill.	2:40 p.m.	Aug. 27	88	58.90	50.2	8.70	60.7	49.0	11.7
Dubuque, Ia.	8:00 p.m.	Aug. 27	68	61.50	50.9	10.60	63.3	49.8	13.5
Fort Dodge, Ia.	3:40 a.m.	Aug. 28	59	61.00	52.5	8.50	62.5	52.0	10.5
Omaha, Neb.	9:00 a.m.	Aug. 28	76	60.80	53.5	7.30	62.0	53.0	9.0

around the ends of the car to the opposite door post in one continuous piece. The insulation is held in position by special holders which do not compress it at any point which would decrease its efficiency. The wood ceiling is covered with five layers of 1-in. insulation, each layer running from side plate to side plate for the length of the car with eight openings cut out for the hatch frames. Under the wood floor are four layers of this insulation, each layer in one piece and covering the full length and width of the car. The spaces between the wood stringers supporting the steel floor are also filled with one layer of Hairinsul.

Four layers of insulation are applied to the hatch covers and to the side doors, each layer being in one piece. The door plates are made of a special non-conductive material.

Icing and Temperature Record of Canadian National Overhead Ice Car 209509 with Shipment of Frozen Fish, Prince Rupert, B. C. to Chicago

Station	Time	Date, 1939	Liquidometer Temp., deg. F. Top	Liquidometer Temp., deg. F. Bottom	Outside Temp., deg. F.	Ice and Salt Supplied, lb. Ice	Ice and Salt Supplied, lb. Salt
Prince Rupert	......	Dec. 7	..	..	..	6,000	1,500
Prince Rupert	......	Dec. 8	..	..	..	2,400	600
Prince Rupert	6:00 p.m.	Dec. 8	20	14	40	....	....
Pacific	1:15 a.m.	Dec. 9	9	10	38	....	....
Smithers	7:25 a.m.	Dec. 9	8	8	30	....	....
Endako	1:10 p.m.	Dec. 9	6	8	38	....	....
Pr. George	6:00 p.m.	Dec. 9	6	6	35	....	....
McBride	......	Dec. 10	6	6	38	....	....
Jasper	8:30 a.m.	Dec. 10	6	6	32	....	....
Edson	2:45 p.m.	Dec. 10	6	6	32	....	....
Calder	9:30 p.m.	Dec. 10	6	6	29	....	....
Wainwright	6:45 a.m.	Dec. 11	6	6	30	....	....
Nutana	5:00 p.m.	Dec. 11	6	8	32	....	....
Melville	7:30 a.m.	Dec. 12	6	7	20	....	....
Rivers	12:45 p.m.	Dec. 12	6	6	20	....	....
Winnipeg	9:00 p.m.	Dec. 12	6	6	4	....	....
Rainy River	......	Dec. 13	4	5	2	....	....
Ft. Frances	2:15 p.m.	Dec. 13	2	2	18	....	....
Duluth	11:30 a.m.	Dec. 14	2	2	30	....	....
St. Paul	6:05 a.m.	Dec. 15	2	2	29	....	....
Milwaukee	......	Dec. 15	8	6	44	....	....
Bensonville	1:35 a.m.	Dec. 16	9	6	37	....	....
Chicago	7:30 a.m.	Dec. 16	9	6	38	....	....

Tests

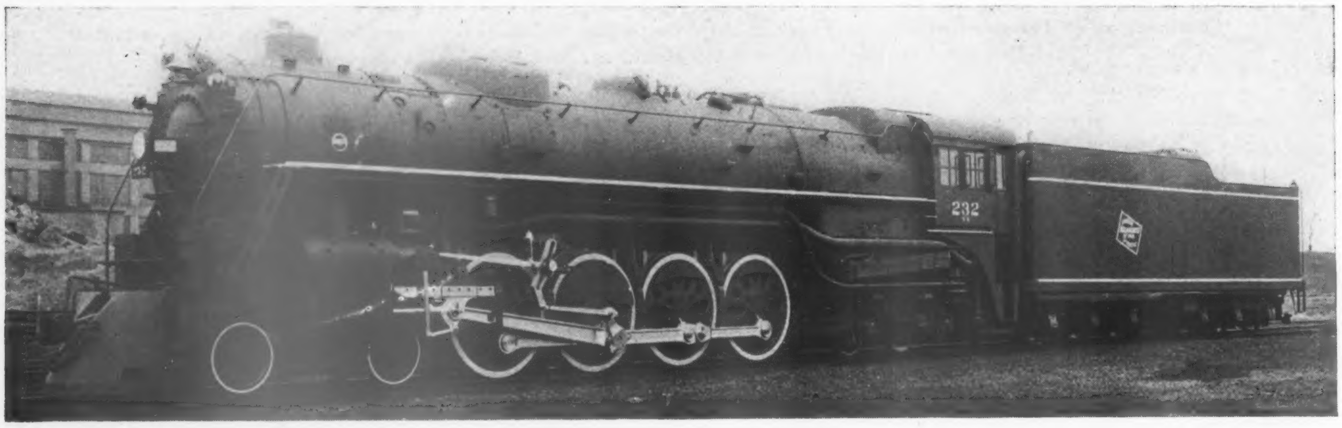
The tests conducted by the Canadian National have demonstrated that these cars possess advantages over the conventional refrigerator car with end bunkers. A great reduction in temperature gradient between the top and bottom of the lading is obtained making it possible to load perishable commodities to the ceiling, particularly those products shipped in a frozen condition. The elimination of end bunkers and doorway bracing, together with the ability to load the cars to the ceiling, permits the cars to be loaded more heavily. The ice in the tanks is effective to the last pound and as the meltage passes down the side flues it absorbs considerable heat before leaving the car, thus reducing the refrigeration costs.

Although the test runs so far for which data are available have of necessity been made during the colder seasons, they do include runs made with shipments of oranges from Florida and California to New York, bananas from New Orleans, La., to Omaha, Neb., and shipments of frozen fish from Canada to destinations in the northern part of the United States.

A test run was made with one of these cars loaded with 840 boxes of oranges weighing 65,520 lb., as compared with a standard end-bunker car load of 462 boxes weighing 34,036 lb., from Bryn Mawr, Cal., to New York. The oranges were at a temperature of 62 deg. F. when loaded and were delivered at New York at a temperature of 45 deg. F. requiring only 12,200 lb. of ice for the entire trip. In another test run made with a shipment of oranges from Auburndale, Fla., to New York, the car carried a load of 65,000 lb. as compared with a standard load of 36,000 lb. On this run the load was cooled an average of 27 deg. F. in about 71 hr.

In an accompanying table is shown the icing and

(*Continued on page 218*)



Milwaukee Buys

More 4-8-4 Freight Power

Ten locomotives recently delivered by Baldwin alike in general proportions to those purchased from the same builder two years ago

An order of ten 4-8-4 type locomotives has recently been delivered to the Chicago, Milwaukee, St. Paul & Pacific by the Baldwin Locomotive Works. These locomotives are similar in dimensions and in general features of construction to the thirty locomotives of the same type delivered by Baldwin to this railroad early in 1938.* They are designed for freight service and develop a tractive force of 70,800 lb. The driving wheels are 74 in. in diameter and the cylinders 26 in. by 32 in. The boilers carry a working pressure of 285 lb. per sq. in. They have an evaporative heating surface of 5,467 sq. ft. and a superheating surface of 2,336 sq. ft. The grate area is 106 sq. ft.

The new locomotives differ in some detail and in weights from the earlier order. The total weight of the engine has been increased 3,100 lb. By redistribution of the weight, the weight on drivers has been increasd about 6,800 lb. There is practically no difference in the combined weight of engine and tender.

The boilers are of the conical-connection type with roof, side and wrapper sheets of silico manganese steel. The joints of all the sheets in the firebox and combustion chamber are butt welded, and an unusual amount of seal welding has been done on the wrapper and throat sheets and on the barrel seams.

Each firebox is fitted with five American Arch circulators and one is installed in the combustion chamber. The locomotives are fired by a modified type B du Pont stoker and have Firebar grates with 20 per cent air openings.

The locomotives have the Wilson feedwater heater, the hot well of which is located about half way back in the tender tank. The boiler equipment also includes the Barco low-water alarm and Wilson sludge remover. In the front end is the Anderson spark arrester.

The foundation of these engines is the Commonwealth bed casting with integral cylinders and back cylinder heads. The driving wheels are Boxpok cast-steel centers, and the journals run in Timken roller bearings. There is an Alco lateral motion device on the front pair. The engine trucks have Timken inside roller-bearing journal boxes and both trailer axles are fitted with American Steel Foundries roller-bearing units.

* See the *Railway Mechanical Engineer* for April, 1938, page 123.

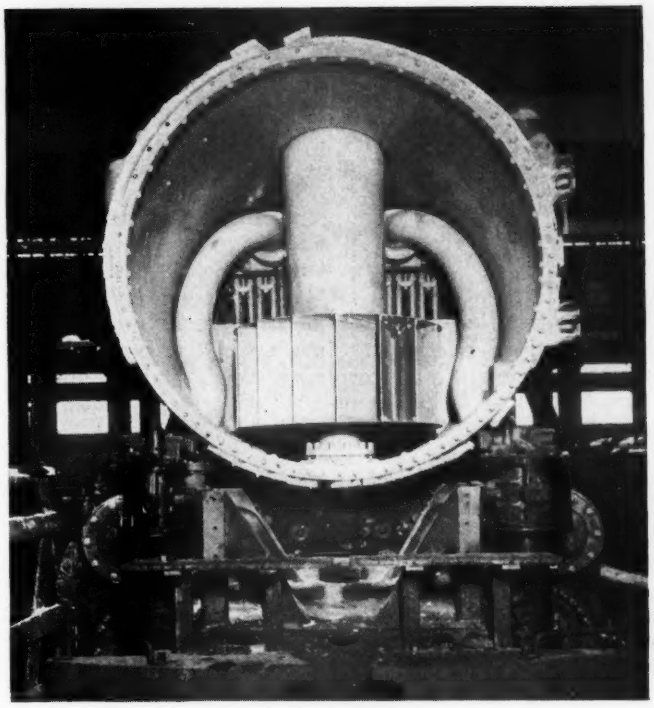
The Commonwealth trailing truck is fitted with A. S. F. roller-bearing units

The main and side rods are fitted with floating bushings on all crank pins, with fixed bushings of Hunt-Spiller gun iron in the rods. The cylinder and valve-chamber bushings are also of this material, and the pistons have Hunt-Spiller valve bull rings with combination bronze and iron Duplex sectional packing.

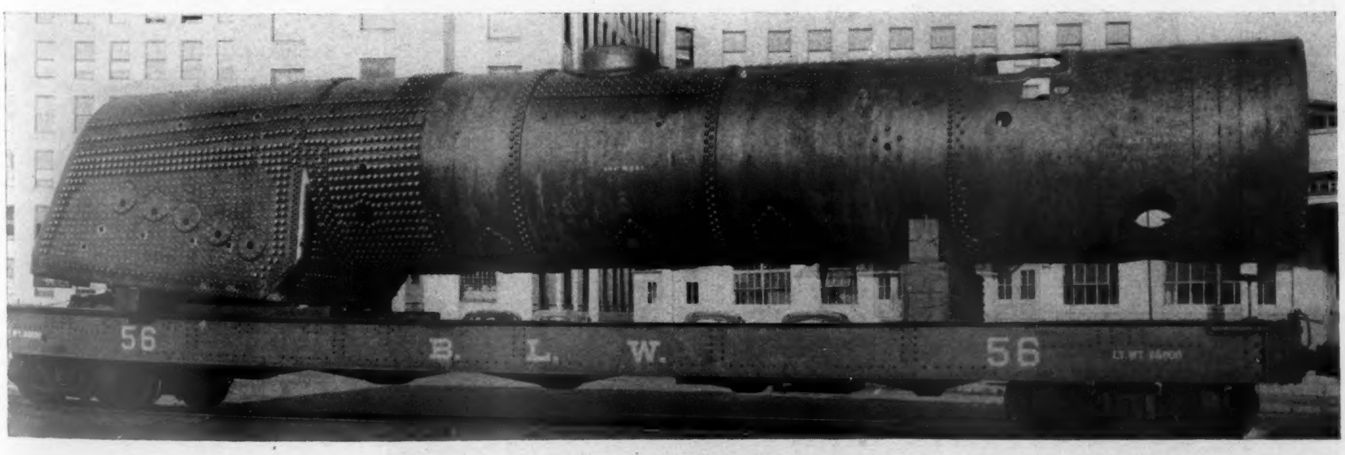
The Walschaert valve motion provides a valve travel

General Dimensions, Weights and Proportions of the C. M. St. P. & P. 4-8-4 Type Locomotives

Railroad	C. M. St. P. & P.
Builder	Baldwin
Type of locomotive	4-8-4
Road class	S-2
Road numbers	231 to 240
Date built	1940
Service	Freight
Dimensions:	
Height to top of stack, ft.-in.	16- 0
Height to center of boiler, ft.-in.	10- 8
Width overall, in.	130½
Cylinder centers, in.	92½
Weights in working order, lb.:	
On drivers	289,147
On front truck	84,963
On trailing truck	119,440
Total engine	493,550
Tender	394,300
Wheel bases, ft.-in.:	
Driving	19- 3
Rigid	12- 10
Engine, total	47- 4
Engine and tender, total	96- ½
Wheels, diameter outside tires, in.:	
Driving	74
Front truck	36
Trailing truck, front	38
Trailing truck, back	44
Engine:	
Cylinders, number, diameter and stroke, in.	2-26×32
Valve gear, type	Walschaert
Valves piston type, size, in.	14
Maximum travel, in.	7½
Steam lap, in.	1¼
Exhaust clearance, in.	¼
Lead, in.	¼
Cut-off in full gear, per cent	85
Boiler:	
Type	Conical
Steam pressure, lb. per sq. in.	285
Diameter, first ring, inside, in.	90 8/16
Diameter, largest, outside, in.	100
Firebox length, in.	150
Firebox width, in.	102¼
Height mud ring to crown sheet, back, in.	73⅝
Height mud ring to crown sheet, front, in.	92⅛
Combustion chamber length, in.	72
Circulators, number	6
Tubes, number and diameter, in.	66- 2¼
Flues, number and diameter, in.	201- 3¾
Length over tube sheets, ft.-in.	21- 0
Net gas area through tubes and flues, sq. ft.	11.32
Fuel	Soft coal
Stoker	Modified Type B, du Pont
Grate type	Firebar
Grate area, sq. ft.	106
Heating surfaces, sq. ft.:	
Firebox	294
Comb. chamber	137
Circulators	105
Firebox, total	536
Tubes and flues	4,931
Evaporative, total	5,467
Superheater	2,336
Combined evap. and superheater	7,803
Feedwater heater, type	Wilson
Tender:	
Type	Water bottom
Water capacity, gal.	20,000
Fuel capacity, tons	25
Trucks	Six-wheel
Journals, diam. and length, in.	7 × 14
Rated tractive force, engine, 85 per cent, lb.	70,800
Weight proportions:	
Weight on drivers ÷ weight engine, per cent	58.58
Weight on drivers ÷ tractive force	4.08
Weight of engine ÷ evap. heat. surface	90.03
Weight of engine ÷ comb. heat. surface	63.25
Boiler proportions:	
Firebox heat. surface, per cent comb. heat. surface	71.64
Tube-flue heat. surface, per cent comb. heat. surface	63.19
Superheat. surface, per cent comb. heat. surface	29.93
Firebox heat. surface ÷ grate area	5.05
Tube-flue heat. surface ÷ grate area	46.51
Superheat. surface ÷ grate area	22.03
Comb. heat. surface ÷ grate area	73.61
Gas area, tubes-flues ÷ grate area	0.107
Evap. heat. surface ÷ grate area	51.57
Tractive force ÷ grate area	667.9
Tractive force ÷ evap. heat. surface	12.95
Tractive force ÷ comb. heat. surface	9.07
Tractive force × diam. drivers ÷ comb. heat. surface	671.4



The Anderson spark arrester



The high-capacity boiler for the Milwaukee freight locomotives

of 7½ in. The valve events are the same as those on the earlier order of locomotives, except that the exhaust clearance has been increased from ⅛ in. to ¼ in.

A notable difference in the design of these locomotives lies in the method of counterbalancing. On the earlier locomotives, after counterbalancing all revolving weights and cross-balancing those in the main wheels, 39.5 per cent of the reciprocating weight (a few pounds less than 2,300 on each side) is balanced. At the diametral speed (74 m.p.h.) this gives a calculated dynamic augment of 11,285 lb. in each of the first and main wheels, 12,300 lb. in the third wheel, and 11,400 lb. in the fourth wheel.

On the new locomotives a departure was made from this method of balancing. Just as in the case of the former locomotives, all revolving weights are counterbalanced and those in the main wheel are cross-counterbalanced. Instead of compensating for a percentage of the reciprocating weights, however, the portion of the reciprocating weights which remain unbalanced in relation to the total weight of the locomotive was used as a basis for determining the amount of reciprocating overbalance.

For these locomotives 3.52 lb. of reciprocating weight per 1,000 lb. of the total weight of the locomotive were left unbalanced. The total weight of reciprocating parts on each side is 2,309 lb., of which 1,739 lb. remain unbalanced. The balance for the remaining 570 lb. is distributed 120 lb. in the main wheel and 150 lb. in each of the front, intermediate and back wheels. Less overbalanced is placed in the main wheel than in either coupled wheels to compensate for the vertical component of the horizontal inerita forces of the reciprocating parts and the piston load brought about by the angularity of the main rod.

The determination of the revolving and reciprocating portions of the weight on the main rod is based on the center of percussion rather than on the center of gravity. The center of percussion was determined by actually swinging the rod as a pendulum about the center of the crosshead pin.

At diameter speed the dynamic augment due to the overbalance in the front, back and intermediate wheels is 7,700 lb. and for the main wheel, 6,160 lb.

The tender is built up on a General Steel Castings water-bottom underframe and is carried on two General Steel Castings six-wheel trucks. The trucks have 7-in. by 14-in. journals which are fitted with American Steel Foundries roller-bearing units with SKF bearings. The Simplex Unit Cylinder clasp brakes have one brake cylinder per truck. The Franklin Type E-2 radial buffer is applied between the engine and tender.

The locomotives have Westinghouse 8ET brakes with two 8½-in. cross-compound compressors.

The principal dimensions, weights and proportions are shown in the table.

Canadian National Refrigerator Cars

(*Continued from page 215*)

temperature record of a shipment of frozen fish from Prince Rupert, B. C., to Chicago which is typical of the test runs made with this commodity. The shipment weighed 41,116 lb. and the car was billed to re-ice if the top inside temperature rose above 10 deg. F. using 2,400 lb. of ice and 25 per cent salt. It was not necessary to re-ice en route, although heretofore such shipments during the winter season were re-iced at all seven regular icing stations, and the delay incident to re-icing was eliminated.

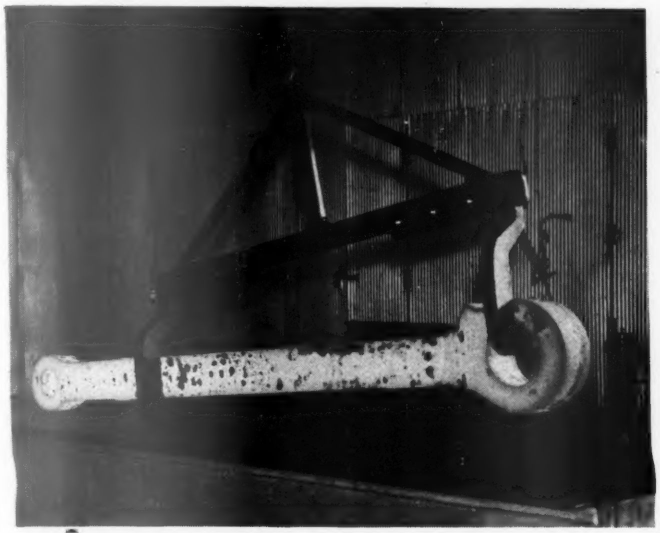
For purposes of comparison the Canadian National ran a test in August, 1939, with one of its experimental refrigerator cars having overhead ice tanks along with a conventional end-bunker car, both loaded with bananas, from New Orleans, La., to Omaha, Neb. The temperature records of both cars are given in another table and show the average top and bottom temperatures and the temperature differences in both cars. It will be noted that it was necessary to undercool the bottom of the load in the end-bunker car in order to quickly cool the top of the load with minimum temperatures as low as 44 deg. F. being obtained. The record shows that much more even temperatures prevailed in the car with overhead icing.

* * *

The frame of a stainless-steel rail car built in Genoa, Italy, for the Italian State Railways—The Budd Shotweld process was used in its construction

Quenched and Tempered

Locomotive Forgings



Quenching a locomotive main rod

By

L. E. Grant*

and

J. W. Crossett†

Properly controlled methods assure longer life and higher factor of safety which more than justify the slight increase in cost

LIQUID quenching, followed by tempering, has been used for years in the automotive industries to produce a combination of high strength, toughness, increased fatigue resistance and a notable increase in resistance to wear. There is no apparent reason, except difference in size of the forgings, to indicate that similar results could not be obtained in locomotive forgings. Previous to the era of streamline high-speed trains, and even now, many of the railroads have lagged behind other industries in the application of heat treatment other than annealing, or normalizing and tempering. Liquid quenching of running-gear parts such as axles, rods and pins still appears to be viewed with some suspicion, if not actual distrust by railroad management. However, the excellent results obtained on the basis of both economy and safety with quenched and tempered tires, steel wheels, plain carbon piston rods and crankpins of relatively high hardness may be cited as evidence that distrust of liquid quenching is unwarranted. The Milwaukee's experience with some quenched-and-tempered crank pins has been especially significant. Some of these pins have been in service over 600,000 miles and had worn out of round only .005 in. after 400,000 miles.

In lightweight motion-work parts heat-treated alloy steels are essential to produce the desired physical properties. Even in plain carbon-steel forgings, designed on the basis of yield strength considerably below that obtained by quenching and tempering, the longer life coupled with freedom from costly failures more than justifies the increase in cost due to heat treatment. The general results obtained with quenched and tempered forgings have been so satisfactory on the Milwaukee that about two years ago all rod forgings made in the shop were specified to be quenched and tempered. These rods are made from plain carbon, low-carbon-nickel, or chrome-nickel steel of the compositions shown in Table I. Plain carbon steel is used for the side- and main-rod forgings on small locomotives not operated at high speeds, while alloy steels are used on the high-speed heavy-duty passenger and freight locomotives. Alloy steels are also used for eccentric and radius rods for all classes of locomotives. Except for minor variations the plain carbon and low-carbon-nickel steels correspond to the A. A. R. Specification M-105-34 while the chrome-nickel steel is S. A. E. 3130.

Billets for the various forgings are ordered large enough to insure adequate reduction in forging and are inspected and marked in the manner covered by the A. A. R. specification. Billets are stored outdoors and in winter are taken into the shop at least 24 hours before

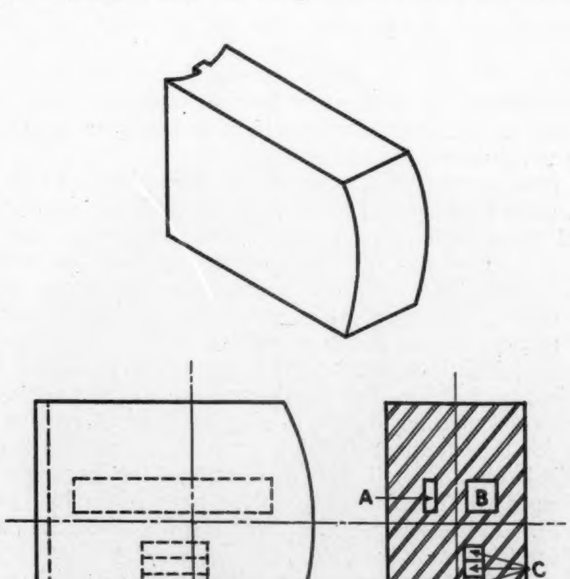


Fig. 1—Location of test bars in forging prolong: *A*, bend-test bar; *B*, tensile-test bar; *C*, impact-test bar

* Metallurgical and welding engineer, Chicago, Milwaukee, St. Paul & Pacific, Milwaukee, Wis.

† Assistant metallurgist, Chicago, Milwaukee, St. Paul & Pacific, Milwaukee, Wis.

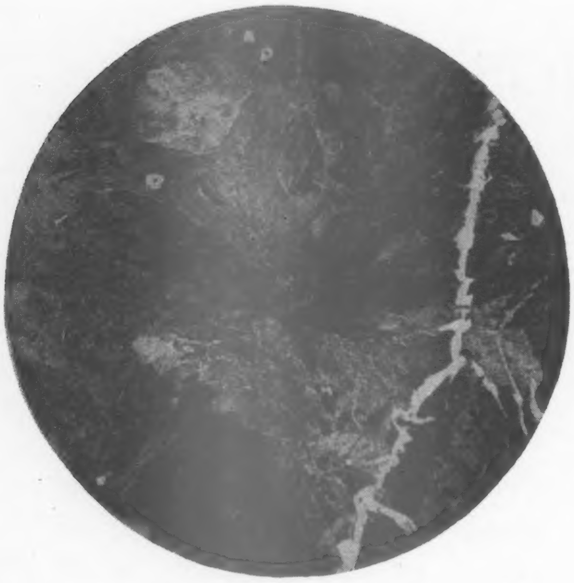


Fig. 2—Mallet main rod as forged—100 diameters

Fig. 3—Mallet main rod as quenched—100 diameters

they are to be heated for forging. Large billets are often placed in the forging furnace at the end of the day's work and left there until the following morning to insure against too rapid heating. The forging temperature varies from 2,000 deg. F. to 2,150 deg. F., depending on the material. Special care is taken in heating alloy billets to prevent overheating and the production of thick, tough scale that is extremely difficult to remove and which shortens the life of the milling cutters in machining. It has been found that the forge-shop cost on rods is considerably lower when the end contours and holes are flame cut instead of forged. The rods are preheated to about 700 deg. F. before cutting and an allowance of approximately 3/8 in. is made for machining to insure the removal of all checks, decarburized, or heat-affected metal from the finished rods.

A prolong, the full thickness of the forgings and about 5 in. wide by seven in. long, stamped with an identifying serial number, is left on a sufficient number of rods to provide at least two test-bar coupons for each heat-treating charge. The prolongs remain attached to the forgings by a strip 3/8 in. wide, as shown in Fig. 1. After heat treatment, one prolong from each furnace charge is broken off and turned over to the test department for physical tests. Test-bar blanks are sawed from the prolong in the manner shown in Fig. 1. The *A* portion is used for the standard 0.505-in. test bar, one face being polished for a Brinell test to determine the hardness of the forging. The *B* section is used for a 3/8-in. by 7/8-in. by 6-in. bend test bar. The three blanks, labelled *C*, are used for Charpy impact bars.

The rough, flame-cut rods are placed on cast-iron supporting blocks in a car-bottom furnace for heat treatment. The blocks are placed so as to support the rods substantially and still have adequate circulation. Initially the furnace temperatures were controlled manually, but since the installation of automatic temperature controls there has been a marked improvement in the uniformity of the results obtained. Unless the larger forgings are normalized before quenching, it is difficult to obtain the desired fineness of grain. All of the rods regardless of composition are oil quenched from 1,550 deg. F. and removed from the oil when they have reached approximately 200 deg. F. The oil in the quenching tank is circulated through a cooler, and forgings are not quenched if the oil temperature is above 175 deg. F. All rods regardless of composition or size are tempered at 1,200 deg. F. The time at heat is determined by the size of the forging and the properties desired. Chrome-nickel forgings are quenched in the oil bath after tempering to avoid possible brittleness. If the results of the physical tests or microscopic examination are not satisfac-

Table I—Percentage Composition of Heat-Treated Forgings

	Carbon	Manganese	Phosphorus	Sulfur	Silicon	Nickel	Chrome
Plain carbon (S.A.E. 1050)	.40–.55	.60–.90	.045 max.	.050 max.	.15 min.	.25 max.	.15 max.
Low-carbon nickel	.20–.30	.65–.95	.045 max.	.050 max.	.15–.35	2.50–3.00	.15 max.
Chrome-nickel (S.A.E. 3130)	.25–.35	.50–.80	.045 max.	.050 max.	.15 min.	1.0–1.5	.45–.75

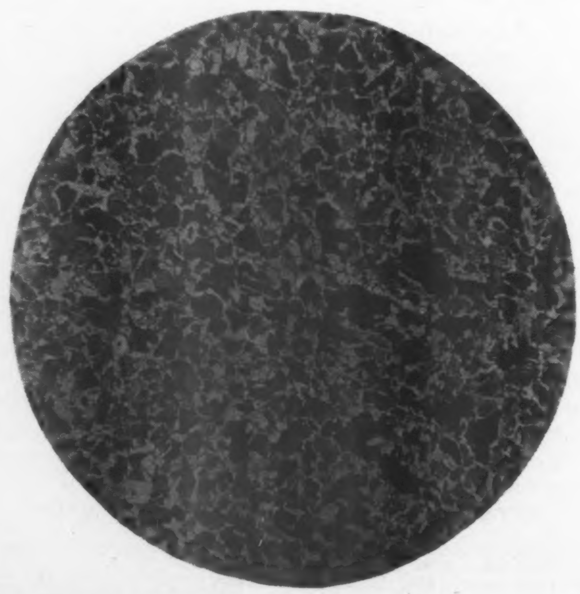


Fig. 4—Mallet main rod as normalized—100 diameters

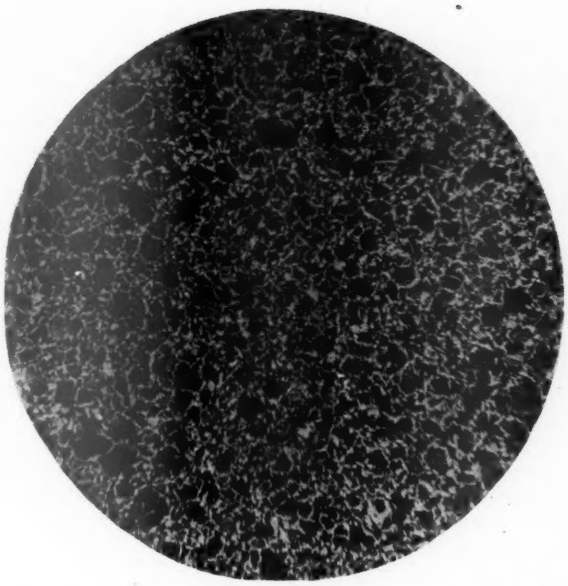


Fig. 5—Mallet main rod, quenched and tempered—100 diameters

tory, the lot is given additional treatment as may be required to produce the results desired. In the event that the treatment is repeated, a new set of test bars is made from another prolong. Due to failures definitely attributed to notches and deep tool marks it has been deemed necessary to polish all rods to remove sharp corners and tool marks. The polished rods are stamped with a serial number to identify them. A record is maintained connecting the serial number with the date of manufacture, heat treatment given, physical properties obtained, and composition of the steel.

Table II—Average Physical Properties of Heat-Treated Rods

Class	Type	Yield point, lb. per sq. in.	Tensile strength, lb. per sq. in.	Per cent elongation in 2 in.	Per cent reduction of area	Brinell hardness	Ft. lb. Charpy
Main	Plain carbon	56,000	93,900	26.6	48.8	192	28
Main	Low-carbon-nickel	67,300	92,200	28.5	66.3	202	—
Side	Plain carbon	60,500	100,100	25.9	53.0	192	29
Side	Low-carbon-nickel	75,400	97,600	28.1	66.3	196	65
Small	Low-carbon-nickel	70,980	95,500	28.5	64.6	196	65
Small	Nickel-chromium 3130	59,800	92,200	29.8	67.0	192	68.5

The rods may be divided into three groups according to size; namely, main, side, and miscellaneous, the latter including radius and eccentric rods. These three types may be further subdivided according to composition. The main and side rods are plain carbon or low carbon nickel, the miscellaneous rods being either low carbon nickel or

Table III—Effect of Heat Treatment on Properties of Carbon Steel

	As forged	Normalized	Quenched	Quenched and tempered
Yield point, lb. per sq. in.	49,700	43,300	68,300	54,400
Tensile strength, lb. per sq. in.	98,450	85,200	106,400	94,400
Per cent elongation in 2 in.	13.0	24.0	16.0	28.5
Per cent reduction of area	14.4	35.9	34.7	56.0
Charpy impact reading	9.2	13.2	17.7	29.0
Brinell hardness	196	163	207	196

S. A. E. 3130. Table II shows the average physical properties obtained with each type made in the past two years.

A few of these rods were of the lightweight type, but the majority were made to the old design based on normalized plain carbon steel. Heat treatment of the latter class was not intended to develop the maximum strength of the steel but was adopted to provide a larger factor of safety in operation and to increase resistance to wear. Many of the locomotives on which these parts are used are in much heavier service than they were several years ago and it was desired to furnish material with a higher fatigue strength. The higher tensile, yield point, and impact values are obtained with no sacrifice in ductility. Actually the ductility is somewhat higher than can be obtained consistently in normalized and tempered steel of considerably lower strength. The high impact values of the alloy steel as compared with the plain carbon steel (Table II) is noteworthy. If impact strength is accepted as a measure of the ability of the steel to withstand occasional overloading without developing fatigue cracks, the value of both the heat treatment and alloy additions is apparent.

The question may be raised as to why plain carbon steel is used at all for rod forgings in view of the better properties obtained with alloy steel. The reason for

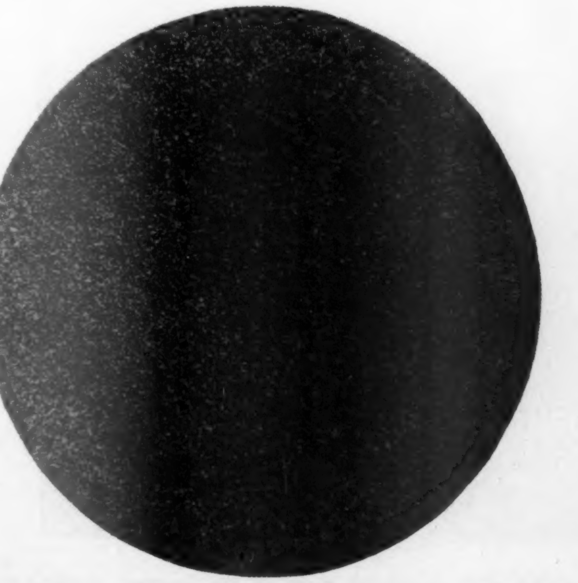


Fig. 6—Chrome-nickel rod, quenched and tempered—100 diameters

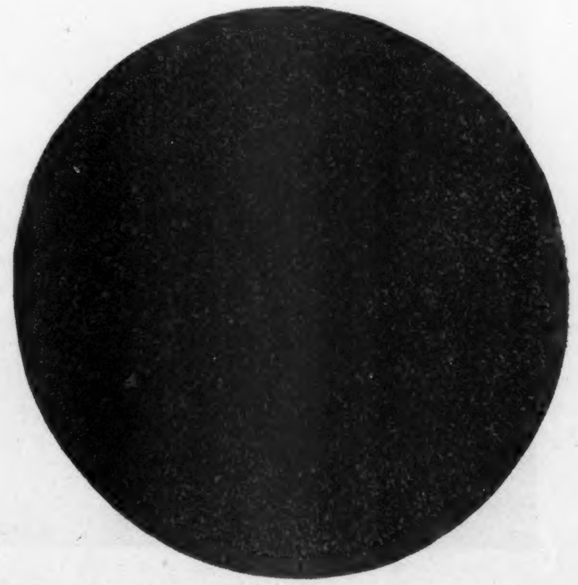


Fig. 7—Low-carbon-nickel rod, quenched and tempered—100 diameters

this is the fact that many of the locomotives are of the older types, operating under less severe conditions than the new power. The properties of the heat-treated plain carbon rods are so much superior to the untreated unalloyed type that the increased cost of alloy forgings did not appear justifiable. As explained above, safety and increased wear resistance were the main objectives.

One of the earlier orders for heat-treated carbon-steel rods includes a set of four main rods for a Mallet locomotive. In order to make a comprehensive study of the benefits derived from heat treatment, prolongs were left on each of the rods to furnish enough specimens to make a complete examination of the forgings during each step of the treatment. One prolong was removed after each step of the manufacturing operations; i. e., forging, normalizing, quenching, and, finally, after tempering. Each of these prolongs was handled in the manner described above for the finished rods. The results are given in Table III. Normalizing reduced the "as forged" yield point and tensile about 13 per cent, while the elongation was increased 150 per cent and the reduction in area 44 per cent. The yield point and tensile strength of the "as forged" rods were very good but the ductility was too low, indicating a rather brittle condition. Quenching raised the yield point and tensile strength values above those obtained after forging, while the elongation and reduction in area were decreased slightly from the normalized state but were much better than in the "as forged" condition. Tempering brought the yield point and tensile strength down to the desired values and at the same time raised the ductility producing the best balance of physical properties obtained in any of the treatments. The rods in this final state have superior physical properties compared to the normalized and tempered rods formerly used in this service. One of the most remarkable changes brought about in heat treatment was the increase in Charpy impact values. The "as forged" bars had an impact value of only 9 ft. lb. and this was raised almost 50 per cent to 13 ft. lb. by normalizing. Quenching increased the value to about 18 ft. lb., while tempering raised it to 29 ft. lb. This is about average for forgings of this character.

The microstructures of the rods in the various stages are shown in Figs. 2 to 5 inclusive, and are helpful in understanding the changes in physical properties. The "as forged" rods had an extremely coarse grain structure surrounded by a network of ferrite, which accounts for the low ductility. Normalizing broke up the coarse continuous ferrite network, and reduced the size of the pearlitic grains. Increased ductility accompanied by lower yield point and tensile strength resulted from this treatment. Quenching refined the grain somewhat further and raised the hardness and tensile strength with little change in ductility. Final tempering converted the steel to fine-grain ferrite and sorbite. Steel in this condition is tough, reasonably hard and strong, yet has sufficient ductility to withstand shock loading without developing cracks. Figs. 6 and 7 show the structure of similar rods of chrome-nickel and low-carbon-nickel steel quenched and tempered.

It is confidently expected that liquid quenching of plain carbon steel followed by tempering will be extended to other parts. The benefits obtained are so important that the slight increase in cost per forging can easily be justified. The longer life obtained by the increased hardness will of itself justify the cost of heat treating. The margin of safety is of itself worth more than any increase in cost. When one considers that quenching and tempering produces forgings with the ductility and impact strength of low-carbon steel combined with the strength and hardness of higher-carbon steels, there ought not be much question as to the desirability of such material for use on modern locomotives. Obviously the heat treatment and tests must be controlled by trained personnel.

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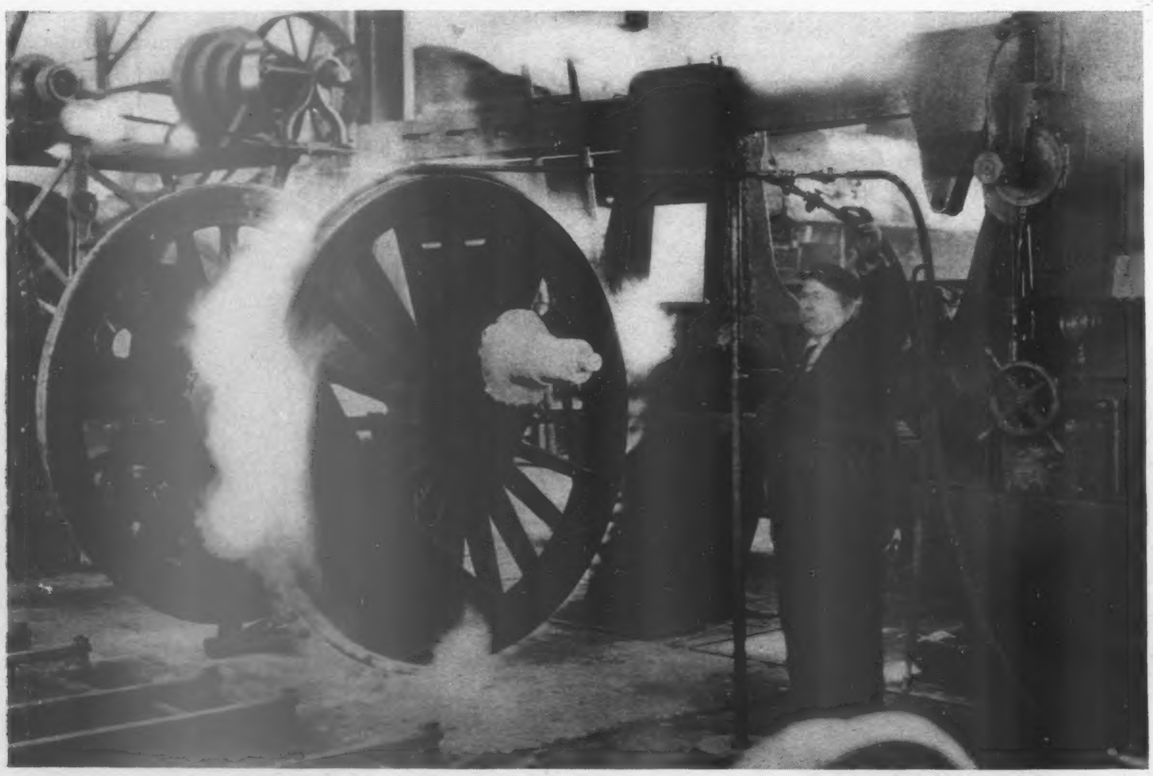


Equipment used in changing driving-wheel tires at the Sacramento, Cal., locomotive shops of the Southern Pacific

Problems of

Freight-Car Weight Reduction*

By V. R. Willoughby†

A discussion of the possibilities of weight reduction offered by the low-alloy high-tensile steels in which is pointed out the penalty imposed by the empty-and-load brake rule

Excessive dead weight in railway vehicles is serious in that, while the track is as level as practical, still there are grades to negotiate which take power to ascend and require retarding means to keep from excessive speeds in descending. Experience has fairly well established the strength requirements of the vehicle under normal operating conditions. Abnormal conditions such as collisions and wrecks are an entirely different story.

Let us look into the history of the railway car. Railway car designers have taken the materials used in other industries, in fact very seldom have there been any materials devised especially for railway car construction. The early cars were made principally of wood with metal running gear, wheels, axles, bearings, boxes, etc., that is, metal was used where the service demands were such that wood was not suitable. The introduction of metals in the car structure, other than running gear, was gradual and it was not until about the beginning of the present century that we had the all metal freight car. In the design of this car engineers used materials and certain methods of construction already developed to a high degree in the construction of bridges and other steel structures.

As a large number of vehicles are built from a single design, any saving in one unit reflects largely in the cost of an order for cars, which often runs from the hundreds into the thousands. It is clearly evident that the question of weight must be carefully scrutinized. Every pound of dead weight added to the individual car structure is multiplied many times in the train and calls for a correspondingly increased tractive force from the locomotive.

Years of study of failures have enabled those engaged in railway car design and operation to set up certain standards of strength. These, of course, are all based on normal operation with the cars on the rails. When the cars left the rails, due to derailment or wrecks, cars became damaged, as it is absolutely impracticable to design railway cars which can be operated economically and attempt to meet such drastic conditions.

The World War taught us a great deal in the way of improved materials. The automobile required further refinement in metals. The aeroplane has had a marked influence on other types of materials and methods of construction. The railway car is subject to all kinds of weather. Many cars are subject to the corrosive influence of the lading. The car design engineer must take all these into account. Corrosion, especially atmospheric, takes a great toll out of railway car equipment.

The metallurgists have progressed far in providing improved materials. Numerous designs of cars have been brought out using these improved materials.

Evolution of Weight Reduction

From a freight-car standpoint, the approach was as follows:

What improvement can be made in the existing types of cars utilizing low-carbon open-hearth steel and riveted construction? A concrete example of the results of this study is the A.A.R. standard box car, approved by the A.A.R. in 1932. The standard 50 and 70-ton hopper cars followed shortly thereafter. The weight saving in these cars was substantial but not sufficient to render obsolete the large amount of equipment which in reality had become expensive to run. These designs were based on the best engineering data available and set up standards of strength which experience had shown to be about the best balance that can be obtained between the strength and weight of the car commensurate with its economic operation.

Realizing that much more must be done in the way of lightening our rolling stock and adding to its service life, alloy steels were next considered. The development of the low-alloy high-tensile steel, with its increased resistance to corrosion under atmospheric conditions, and its substantial increase in strength, provided the car designer with a very good material with which to effect substantial savings in weight. Even though the members were materially lightened, the fact that these low-alloy high-tensile steels were better rust resisting, the thinner materials should give equal or better life than the thicker members of low-carbon open-hearth steel. On the other hand, the higher tensile strength permitted substantial weight savings in the heavier members of the car structure. Numerous cars were built, including open top as well as house cars.

With the use of the higher strength materials and the thinner section it was realized that the method of construction should be changed. Where you rivet thin sheets to heavier frame members, the weak point is generally the bearing value of the thin sheet on the rivets. Again, a riveted joint does not permit the full section of the material to be available as deduction must be made for rivet holes, especially in members subjected to tension.

Some designers, as far as government regulations will permit, want to weld the entire structure. In quantity production there is an economic limit to the substitution of welding for rivets. There are certain places in the car structure where rivets are more advantageous. From the quantity-production standpoint the welding torch is not desirable, or at least should be kept to a minimum, on the final assembly or building track. Where parts may be joined in what we call sub-assemblies the work can be scattered over a sufficiently large area so that the ill effects from the bright light of the welding torch may be practically eliminated.

There are places where the spot weld gives the best method of attaching the various members together. This calls for, in many instances, rather elaborate machines,

* From a paper presented before the New York Chapter of the American Society for Metals at New York, May 13, 1940.

† Vice-president in charge of engineering, American Car and Foundry Company.

but because of the large number of units, in a substantial order for cars, the saving that may be effected by the use of these machines is sufficient to warrant their use.

The standard box car of today, to the latest A.A.R. design, in low-carbon open-hearth steel weighs in the neighborhood of 45,000 lb. Since this design was made up there are certain operating features, such as additional floor stringers required for tractor loading service and means of removing floor boards without interfering with the lining, which are very desirable. If these additional features are incorporated in this A.A.R. standard car they would increase its weight to well over 46,000 lb.

What Can Be Done with High-Tensile Steels

By the use of low-alloy high-tensile steels a very marked saving can be made in the weight of this car. Cars have been built with weights from 36,000 lb. up. From the economic standpoint, a car using grade B steel castings, chilled iron wheels and center sills of low-carbon open-hearth steel, is perfectly feasible and will be in every way comparable from a service, strength and life standpoint with the 46,000 lb. A.A.R. car and weigh about 40,000 lb. That is, 6,000 lb. may be saved, which is a saving of over 13 per cent. In other words, a train of 100 box cars weighing 46,000 lb. each, would have a dead weight of 4,600,000 lb. while a train of the 40,000-lb. cars would weigh 600,000 lb. less. Putting it another way, the dead weight of the train having 115 new cars would weigh no more than 100 A.A.R. cars built of low-carbon open-hearth steel.

The statement has been made that it costs approximately $18 a ton per year to haul dead weight. If this is true, then every one of these low-alloy high-tensile steel box cars that weighs 40,000 lb. versus 46,000 lb. (that is, 3 tons less), would show a saving in hauling cost of $54 a year.

Let us consider the open-top car. The weight of the A.A.R. design of the nominal 50-ton car, that is equipped with 5½ in. by 10-in. journals, is given as 41,562 lb. Due to the Interchange Rules it is permissible to load a car equipped with 5½-in. by 10-in. journals to 169,000 lb. on the rail—this figure representing tare weight plus pay load. This standard A.A.R. hopper car may carry a load of 127,438 lb.

What could be done with this car in low-alloy high-tensile steel? Cars have been built, equipped with 50-ton trucks, having a tare weight of not much over 30,000 lb. However, it is perfectly feasible, following the lines given for the box car, to design a hopper car with a nominal capacity of 50 tons, in which the weight should not exceed 35,000 lb. This would permit a pay load of 134,000 lb. This is an increase in pay load of about 6,560 lb., that is over 5 per cent—certainly a substantial amount.

The cost of hauling these cars loaded with this extra pay lading of over three tons, would be the same as the low-carbon open-hearth steel loaded with the three tons less capacity, but when empty the cost would be less because there would be over three tons less dead weight to haul. The extra revenue from the three tons extra lading is substantial. The same results are obtainable in other types of freight cars.

The Braking Situation

This would be very fine if it were not for certain A.A.R. rules that must be followed.

The braking power for a freight car of this class must be not less than 60 per cent, nor more than 75 per cent of the light weight of the car, and should be not less than 18 per cent of the total rail load limit, otherwise the empty-and-load brake should be used.

For a car equipped with 5½-in. by 10-in. journal trucks, the rail load limit is 169,000 lb.; 18 per cent of this is 30,420 lb. which is the minimum braking power we may have if we live up to the recommendations. This braking power is 75 per cent of 40,560 lb. which is the lightest car recommended for the single brake. This rule is not strictly adhered to, but a car with a light weight of 35,000 lb. with only a single brake would be too flagrant a violation of the rules.

This braking rule imposes a severe penalty on the savings, otherwise attainable by the use of modern materials and construction methods in these hopper cars. The extra initial cost for the empty-and-load brake is about $200, and the additional weight penalty is about 500 lb.

What kind of material is best suited for freight-car construction?

Our experience has shown that for car body designs, we need a steel that is ductile, easily worked (both hot and cold), corrosion resistant, of high fatigue value especially at lower temperatures, must be readily weldable and be in the low-price range.

Low-carbon open-hearth steel is an ideal material, except for two features; namely, its tensile value and low corrosion resistance. The low-alloy high-tensile steels that have been introduced and are best suitable for car construction are those where the yield point is something over 50 per cent more than the low-carbon open-hearth steel and where there is a substantial ratio between the yield and the ultimate. To be suitable for car construction this steel should be as easily worked as low-carbon open-hearth steel except for the increased strength. It should have a substantial increase in corrosion resistance, especially against atmospheric corrosion and should have good shock resistance at the low temperatures through which cars must operate in the winter time. It is extremely essential that this steel be readily weldable without air hardening.

The price differential as compared with low-carbon open-hearth steel must be such that the weight savings permissible due to the increased strength and better corrosion resistance may absorb practically all the increase in cost.

There are a substantial number of cars in service utilizing various brands of low-alloy high-tensile steels and, as far as I have been able to learn, these steels are giving a satisfactory account of themselves. Only time will give the answer to their true value in comparison with low-carbon open-hearth steel and with each other.

[Mr. Willoughby also discussed a number of interesting tank-car developments and concluded with a brief discussion of the use of modern structural materials in passenger cars.—Editor.]

* * *

Photo by C. Parker

A "double-ender" and train in local service on the Boston & Albany at Newton Centre, Mass.

EDITORIALS

Availability of Steam Locomotives

There are some roads on which consistent effort has been put forth to increase the utilization of locomotives. Generally speaking, however, the urge to do so is not nearly so great in the case of the steam locomotive as it is in the case of the Diesel-electric locomotive.

The inventory of steam locomotives, particularly those for freight service, is based on the peak traffic demands for which motive power must be available. Except for the relatively short periods of peak demand, a surplus of motive power is available so that the need for intensive utilization is far from continuous.

Since the urge for intensive utilization on the part of the operating department is not great, the mechanical department finds itself under relatively little pressure in the matter of availability except during the period of peak demand. Some mechanical departments, however, have made a particular effort to keep down the number of active locomotives because there are some increases in expense which vary with the number of locomotives being handled irrespective of the intensity with which they are being used.

In the case of the Diesel-electric locomotive, because of the high first cost, intensity of utilization is one of the first considerations. The particular advantage of these locomotives in the matter of availability is freedom from the necessity of fire cleaning. Those in passenger service are equipped with steam-heat boilers which require practically the same periodic inspections and tests as the steam locomotive boiler, so that the only advantage the Diesel-electric locomotive has in this respect is the shorter time required to complete the tests. In the matter of fire cleaning the disadvantage of the steam locomotive is more psychological than real.

Twenty or more years ago there were probably very few railroad men who thought it feasible to operate a steam locomotive for more than about 200 or 250 miles without servicing. Then came the rapid spread of interest in long locomotive runs, first in freight service and then in passenger service, and it was soon demonstrated that with the proper technique of handling the fire the only services required at intermediate terminals on the long runs were the dumping of the ash pan and attention to lubrication. The latter has now ceased to be a problem, at least as far as the newer locomotives are concerned.

During this period it was also clearly demonstrated that locomotives could be kept under steam without knocking the fire for periods much longer than would be required by any conceivable continuous runs. On the St. Louis-San Francisco a freight locomotive operated 7,350 miles in 1929 without dumping the fire. A year later another freight locomotive on the same railroad operated for 31 days, during which time it made 9,700 miles with crews changed 79 times, with a single fire. During this demonstration the average time of cleaning fires at terminals was about 25 min.

What now needs to be done with respect to these under-utilized capabilities of the steam locomotive is to reappraise the possibilities for further reducing the total amount of motive power required to meet the maximum traffic conditions. On some railroads at least, with the purchase of modern high-capacity freight locomotives, a heavy proportion of the main-line traffic has been handled by a relatively small assignment of the new power. Such locomotives have proved their ability to stay out of the back shop for well up toward 300,000 miles and their ability to average a high daily mileage.

There are, of course, two problems involved in obtaining the ultimate objective. The first is the provision of a maximum of availability by the mechanical department. The second is the utilization by the operating department of the locomotive hours provided by the mechanical department. If an appreciable reduction is to be made in the number of locomotives required in an assignment, however, the first problem lies with the mechanical department.

A renewal of interest in developing the possibilities for greater availability to the full would place the comparison of steam and Diesel-electric locomotives on a fairer basis in this respect. The advantage to the railroads of the low first cost of the steam locomotive will then not be lost without a clear demonstration that it is fully offset by other factors inherently beyond the attainment of the steam locomotive.

The Value of Modern Equipment Is Now Evident

From the standpoint of equipment maintenance American railroads are definitely faced with these important factors: a shortage of skilled mechanics; a shortage of modern shop equipment; an increasing demand for limits of accuracy in shop work as a result of higher operating speeds, and a probable increase in the demand for power as a result of national defense programs. Add all of these things together and it would appear that we are faced with necessity of doing some-

thing about several problems that have been sidestepped under the pressure for reducing operating expenses during the past 10 years.

This is not an appropriate time to call attention to the shortcomings of the past for there are more important matters to be dealt with and the question now is what kind of an intelligent program can be developed for doing a job that is confronting the roads.

Concerning the question of skilled help it may be worth while to call attention to the fact that there are now employed by the railroads about 124,000 machinists, blacksmiths, boilermakers, sheet-metal workers and their helpers and apprentices engaged in the maintenance of motive power. Any attempt now to augment this labor force is going to have to be done in competition with the requirements of all of the industries that will be engaged in supplying the needs of our defense program. The fact that the total number of employees in the above classifications is but slightly more than half of what it was in 1929 and only about 2,000 more than it was in 1933 is both an indication of what has happened to the maintenance forces over a period of 10 years and how little has been done in the past six years to anticipate and prepare for the conditions which we will probably now be required to meet.

The lack of modern shop equipment and the increasing demands for accuracy in shop work are two elements that go hand in hand. It is unfortunate that in railroad shop work the opportunities for cutting the costs of production have been limited by the great varieties of work to be handled and the small quantities of identical parts required. Because of these facts it has been the exception, rather than the rule, that new shop equipment could be justified on the basis of returning as much on the investment as might be the case in industries where greater work volumes prevail. On the other hand there are numerous outstanding examples, in railroad shops, where by consolidation of work at central points the volume of work has been increased, even under depression conditions, to a point where new equipment was installed and the results have demonstrated the economies to be far greater than was expected.

The average railroad demands a return of at least 17 to 20 per cent on the investment in order to justify the purchase of new shop equipment and because the way has not been found to meet this requirement management has arbitrarily decided against new installations in many instances where a little further study would have shown the way to major savings. Instances that have come to light in the past year where new installations have been made and have resulted in returns of from 50 to 60 per cent annually illustrate what can be done.

As matters stand at this moment it is apparent that the railroads are going to be called upon to play an increasingly important part in the events that are to come and it is worth while to take stock with a view to determining what condition they are in to meet the situation. It is of little comfort to say that out of the thousands of unemployed in this country the ranks of the railroads can be filled out when it is common knowledge that the reason for the shortage of skilled mechanical craftsmen is that the ravages of time and our past indifference to the training of men have combined to create a situation wherein there are not enough trained men to go around and not enough time to train them. The course that can be taken is to study the possibilities of further consolidating railway repair operations at central repair points and of equipping those points with such modern facilities as can be secured under present conditions. The competition in the purchase of needed equipment will be just as keen as it will be in the effort to build up shop forces and the most important immediate job is that of determining what kind of and how much equipment will be needed. Industry has been told through all the years of the depression that modernization of plant equipment would be its ultimate salvation in the matter of keeping costs under proper control. As far as the railroads are concerned it probably will not only be a matter of cost control but the only available solution to a production problem involving increased output with existing forces.

How to Increase Freight-Train Speeds

Mechanical-department forces, both locomotive and car, are definitely responsible for providing adequate motive power and freight cars in condition to operate safely at the high speeds necessary to meet modern shipper requirements. As was pointed out by A. R. Ayers, general manager, Nickel Plate, in a paper presented at the April 16 meeting of the Car Department Association of St. Louis, however, there is a growing appreciation that the way to increase the *average* speed of trains between terminals (which is what shippers are interested in) is to pay at least as much attention to reducing delays as to securing high maximum speeds.

The adverse effect of a few minutes delay may be illustrated by the following example: Let us assume that a freight train, in making its schedule and effecting proper deliveries to connections, must operate over a distance of 100 miles at an average speed of 45 miles an hour, or one mile in 80 seconds. If this train meets with a delay of 20 minutes on account of an air compressor failure, a steam leak in the locomotive front end, a hot car journal or a brake beam down, this means 1,200 seconds, which must be made up over the 100-mile run, or 12 seconds per mile. Instead of having 80 seconds to run a mile, therefore, the train can have only 68 seconds, which corresponds to a speed of 53 miles an hour. In other words, to make up the 20-minute delay, the speed of the train must be increased from 45 to 53 miles an hour over the entire 100 miles. When slow average speeds were the rule, there was more margin for making up delays, but it

is easy to see that with the higher speeds of operation today, if the delays reach any considerable amount, they can often be made up only with the greatest difficulty, if at all.

Regarding the influence of delays on motive power and car requirements, Mr. Ayers said "Locomotives will not haul as much tonnage at high speeds as they will at low speeds so that, other things being equal, it requires more train service to handle a given volume of traffic at high speed than it does at low speed. It is therefore evident that any increase in train speeds, brought about by unavoidable delays, causes an unnecessary increase in the cost of operation.

"Train speeds on the road compare quite favorably with the speed of highway vehicles but rail traffic is subject to heavy delays getting through yards, particularly large terminals, and it is here that railroads have a great opportunity. If the inspection, switching, pumping of air, and final air tests are done one at a time, the total time of the train in the yard is the sum of the time of all four operations. To the extent that these operations can be performed simultaneously instead of one at a time, it is possible to affect great savings in time. I will not go into the detailed ways in which this can be done, as operating conditions govern, but I do know that attention to this feature has in some cases reduced the time of getting trains through the yard to considerably less than half of what it used to be. . . .

"Railroads can do a great deal for each other if they maintain their own freight-car equipment to as high a standard as possible and thus keep it off their neighbor's repair track and give him more time to maintain his own equipment. If this results in a higher unit cost for general repair, the difference will at least be made up by a reduction in running repairs and with the great benefit of having cars available at all times between general repairs and in shape to move freight without delay or interruption so far as mechanical defects are concerned. When cars are on repair tracks for any reason they should receive not only the repairs for which they are carded, but should be thoroughly inspected so that any other impending defects can be taken care of and thus avoid another repair-track movement. You have all been bothered with defects which appear on loaded cars. If the repair methods which I have described are followed, many troublesome situations that sometimes result in serious delays to important freight will not occur."

Similar attention to motive power at the time of periodic inspection and repairs will go far to assure the possibility of intensive and reliable locomotive service until the next repair. Mechanical-department forces are indeed an important element in modern railroading and it is essential for supervisors in both the locomotive and car departments to familiarize themselves with and recommend the installation of improved equipment and devices which have demonstrated the ability to provide better service or reduce costs.

Since some of the rules under which railroad men are now working are a heritage from earlier days when equipment was less reliable and less well maintained than it is now, these rules should be subject to constant study with a view to revision to meet present-day requirements. As Mr. Ayers so forcefully expressed it "Restrictive rules are not for the ultimate good of those who make their living from the railroad business because by delaying the prompt and free movement of equipment they will simply drive business off the railroads to their competitors where too much of it has already gone. This country will continue to grow and the surest way for the railroad business to expand is to give the customer constantly more for his dollar. That a great deal has been done in this direction is evident from statistics which show a marvelous improvement in the average speed of railroad trains, faster schedules, much greater reliability in making published schedules and an increasing proportion of traffic being handled in scheduled fast trains."

Mechanical department forces may well feel a healthy glow of satisfaction at the important part which they have played in achieving these objectives and at the same time maintaining an enviable record for safety. The maintenance of these records, however, can be assured only by unceasing vigilance and competent, careful attention to every last detail associated with the design, construction, maintenance and interchange of railroad equipment.

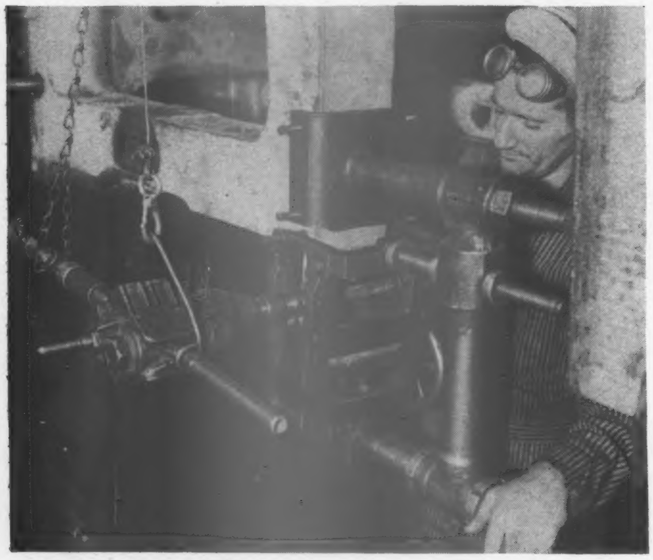
New Books

PROCEEDINGS CAR DEPARTMENT OFFICERS' ASSOCIATION, 1939.—*Published by the Association—Secretary-treasurer, F. L. Kartheiser, chief clerk—mechanical, Chicago, Burlington & Quincy, Chicago. 251 pages. Price $2 (including membership fee).* The proceedings of the annual convention of the Car Department Officers' Association, held at the Hotel Sherman, Chicago, October 17, 18 and 19, 1939, contain the reports of the committees on Freight and Passenger-Car Construction and Maintenance; Shop Operation, Facilities and Tools; Passenger Train Car Terminal Handling; Lubricants and Lubrication; Use of Freight Equipment for Loading Contaminating Commodities; Interchange; Loading Rules; Billing for Car Repairs, and Painting. Included also in the proceedings are the addresses by D. J. Sheehan, superintendent motive power, C. & E. I.; C. H. Dietrich, executive vice-chairman, Freight Claim Division, Association of American Railroads; LeRoy Kramer, vice-president, General American Transportation Company, and L. W. Baldwin, chief executive officer, Missouri Pacific Lines, Mr. Baldwin's address was presented before the third annual meeting of the Coordinated Associations—the Master Boiler Makers' Association, the Railway Fuel and Traveling Engineers' Association, the Locomotive Maintenance Officers' Association, and the Car Department Officers' Association.

Paducah Shop

Jigs, Fixtures and Devices*

By G. H. Raner†



Portable machine milling a locomotive frame pedestal jaw

THE newest large locomotive shop in this country is that of the Illinois Central, located at Paducah, Ky. Relatively little has been said in publications about this modern shop which has now been in existence almost 13 years, having turned out its first general-repair locomotive in September, 1927.

In a plant of this magnitude, where such rehabilitation work as well as fabricating, forging and finishing new parts is carried on, there is a continual need for close attention to the seemingly little things which in the aggregate present the opportunity for large savings of time and materials. In normal locomotive repair work at this shop, many jigs and devices are continually being perfected to improve both the quality and quantity of shop work, often at reduced unit cost. A number of labor-saving devices, developed and successfully used at Paducah shops, are shown in the illustrations.

Properly Fitting Locomotive Frame Binders

In order to machine a smooth surface for exact fitting of frame binders to the pedestals at each driving-wheel location, what is known as a frame pedestal-jaw milling machine is used, consisting of a device fastened between the frame pedestals by means of a bracket and screw construction. A milling cutter, operated by an ordinary reversible air motor, is supported from the balancer shown in the illustration. Vertical feed is effected by a hand wheel. Only metal enough is taken off the frame jaws to clean them properly and leave a smooth surface. Binders are then machined accurately to size, as checked by special gages, and this process assures a good binder fit and obviates loose binders and frame breakage difficulties at this point.

Drilling Locomotive Main Pins

A holding device for use in drilling center holes in new main-wheel crank pins is shown in one of the illustrations. The clamp was cut by an acetylene torch from a piece of 19-C steel 1½ in. thick, made in about two-thirds of a circle, which allows removing and replacing a pin without taking the clamp from the drill-press table. The usual 1-in. T-bolts are used to hold the clamp to the table and there are three set screws for clamping the pin itself, these screws being spaced 120 deg. apart and threaded into nuts which are welded to the clamp. After being centered, the crank pin is lifted by an electric hoist and C-clamp arrangement, a photograph of which is also shown, and placed on a center which is inserted in the bed of the press on the bottom table. The drill spindle is set in line with the center in the bottom table and the crank pin adjusted at the top by the three holding screws until its center is in line with the drill. The pin is therefore set up and held in place with no measurements taken.

It will be noticed in the illustration that two of these clamping devices are used on the same drill press. The former method of clamping the pin against wooden blocks for holding required twice the time in clamping.

Drilling Gib-Bolt Holes in a Crosshead

On the drill-press table is shown a jig for drilling holes in forged steel locomotive crossheads for the bolting of the shoe to the crosshead. This consists of two side plates with wings which extend inside of the crosshead-shoe fit and are drawn together with a 1-in. bolt 24 in. long. The plates are made of forged steel. There are four holes properly spaced in each of the plates in which case-hardened bushings are applied. The crosshead itself with the two side plates applied is held down on the drill-press table by an ordinary clamp bolt. This arrangement permits drilling these holes in one-half the time formerly required and, of course, obviates the former method of laying out each individual crosshead before drilling.

Cutting Fibre Liners

A tool for cutting circular fibre liners from a rectangualr sheet is also shown on the drill press. The cutter holder is adjustable to any size liners needed from 6½ in. to 13½ in. Adjustment is made by a key which may be seen and is held by a set screw in each end. The cutters or blades are made of high-speed steel. The fibre is furnished in large sheets from which liners are laid off to size by a templet and then held for cutting out by nailing sheets to a wood platform placed on the drill-press table. In the center it will be noticed that a small drill is used as a lead to prevent material from chattering while cutting. These liners are used on crossheads to prevent galling of the head and front end of the main rod.

The former practice in making these liners required three different operations in the process of cutting one out. This arrangement permits increasing the number of liners cut in a given time by one-third.

Placing a Hot Tire on a Wheel Center

Lifting and putting in place a tire on a main driving-wheel center is simplified by the hook pick-up device.

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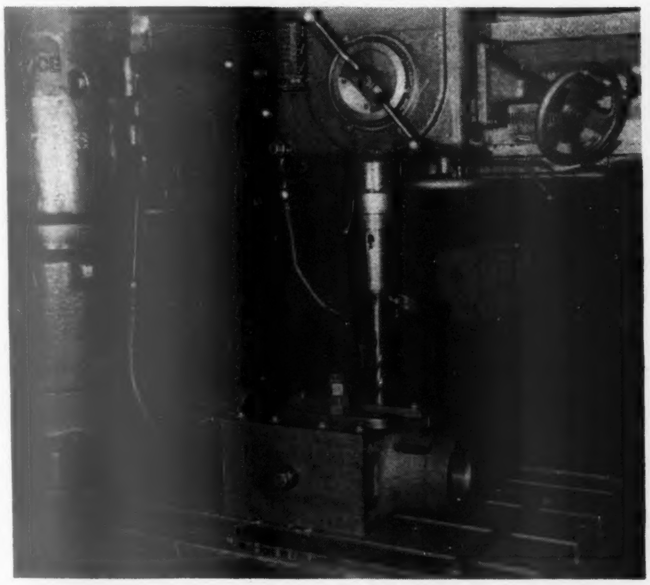
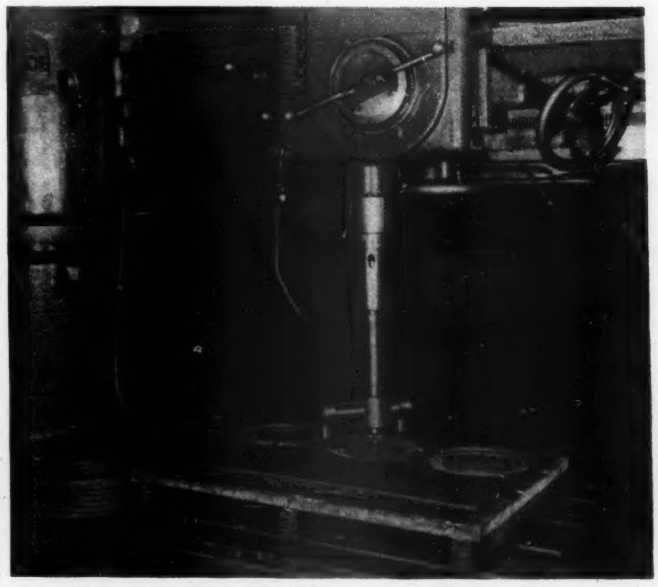
* This is Part I of a two-part article. Part II will appear in an early issue.

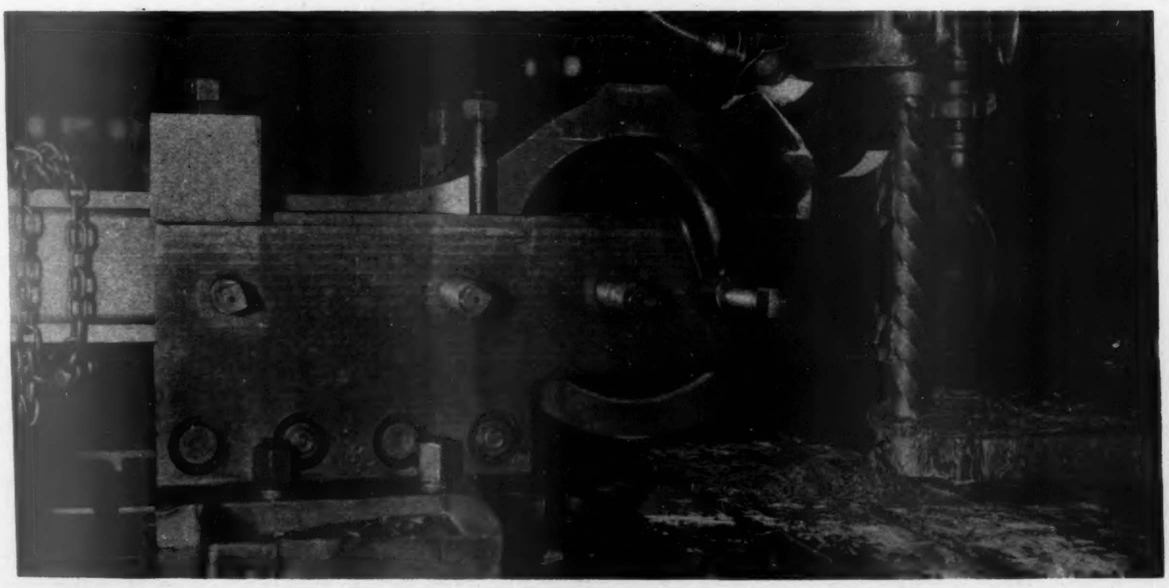
† Assistant shop engineer, Illinois Central.

Device for holding main crank pins while drilling the center holes

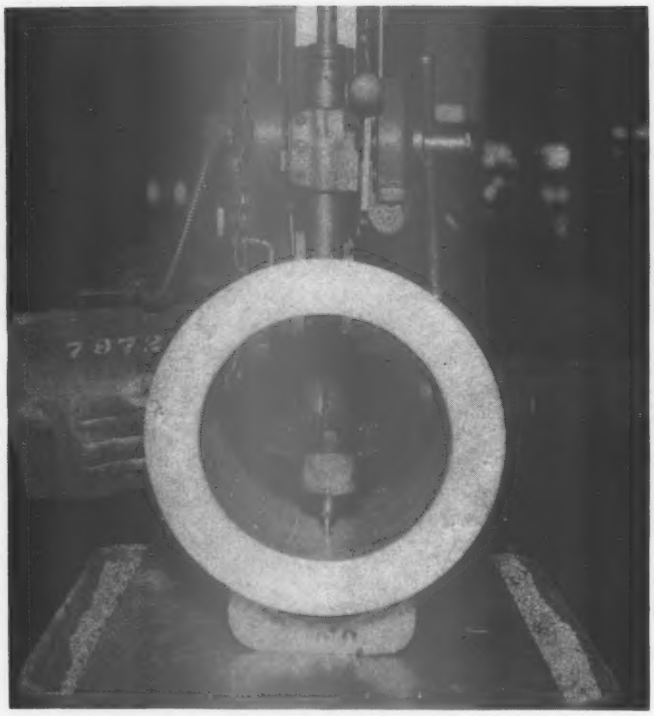




Left: Jig used in drilling main crosshead gib-bolt holes—Right: Tool for cutting fibre crosshead liners



Jig for holding side rods while clevising on a vertical milling machine



Drill extension device for countersinking rod-bushing grease holes on the inside

Universal welding jig for holding truck sides and truck boxes while welding

The hook is forged from steel, a lip on the holder extending about 1 in. in to the bore of the tire with an adjusting hand screw on the opposite side of the tire used for clamping fast to the tire. On the flange side the clamp does not extend down to the bore where it would interfere with placing the tire on the wheel center.

How the crank pin is handled to and from the drill jig

A control handle may be seen in the illustration. This is made of 1¼-in. pipe, for handling in place when the tire is hot. The link through which the lifting chain is placed works freely and is fastened to the clamp by a 1-in. pin with a key in the end. The tire is lifted by an overhead crane and this device obviates chains or other arrangements which are slower and more hazardous.

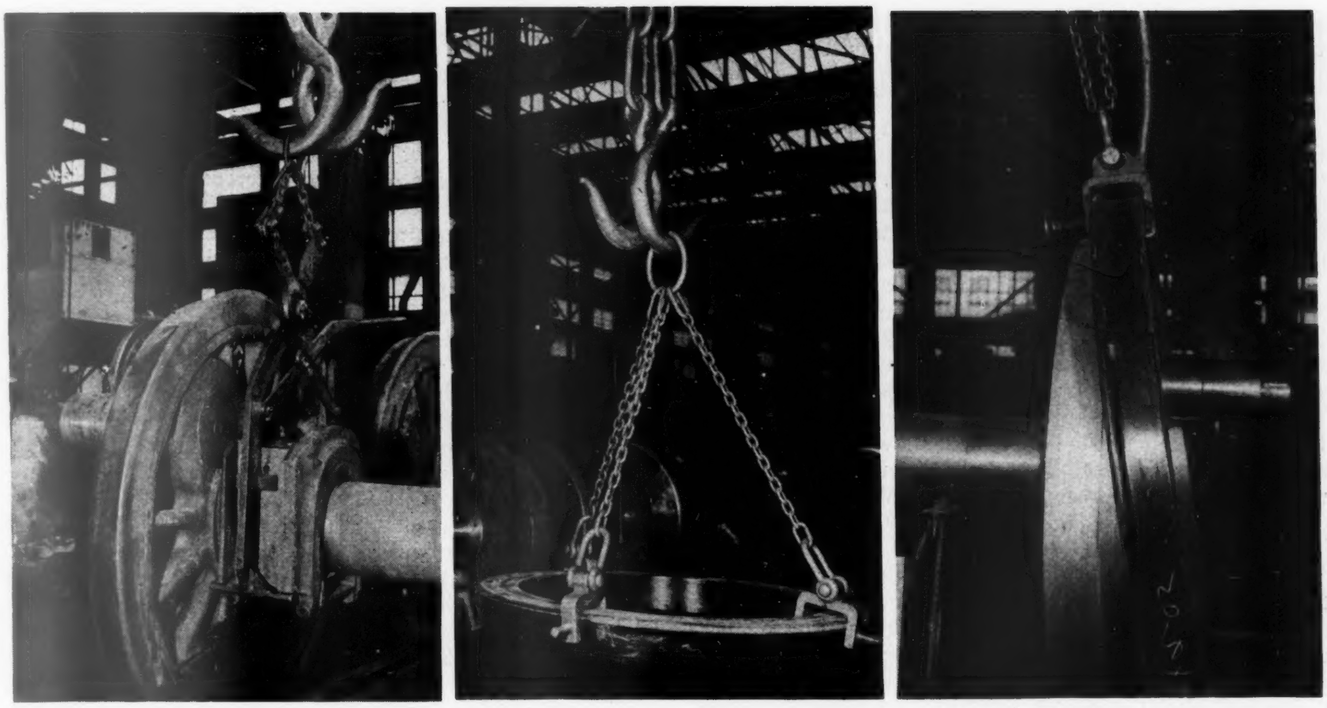
Handling a Driving-Wheel Tire

The three-jaw device, also illustrated, is used for lifting driving-wheel tires on and off a boring machine and for general handling of tires. The clamps are made of forged steel. No lip is used on this device. Set screws are used, but it is not ordinarily necessary to adjust the screws except in case of fastening to an unusually thin tire. Safety and speed are assured in placing this clevis device on and off the tire. The lift is, of course, made by an overhead traveling crane.

Lagging a Boiler

In applying lagging to a locomotive boiler, an adjusting platform is used. It consists of two pieces of 3-in. pipe for supports, each of which is set in a cast-iron base 20 in. in diameter; the base is bolted to a piece of flat iron ¾ in. by 20 in., which is 42 in. long and extends in towards the locomotive. The bases are tied together with two ¾-in. by 4-in. pieces of flat iron at the bottom along the floor. The tops are united by two tie rods 1 in. in diameter. The floor of the platform consists of a steel plate with 1-in. pipe serving as guards or hand railing around the platform. The platform itself is 120 in. long by 44 in. wide and strong enough to support a metal skid box filled with lagging, which is placed by an overhead traveling crane. The height of the platform is made adjustable by means of 1-in. holes in each of the two supporting pipes for a locking pin to conform to the level of the running board of the various type engines.

A ladder, made of 1-in. pipe, is fastened to the platform and supported near the bottom by a brace with a sleeve around the supporting pipe, so that the ladder



Left: Hooks for use in applying or removing locomotive driving boxes—Center: Three-point chain hook for handling driving tires—Right: Device used in applying driving tires to wheel centers

moves up and down as the platform is adjusted. Before the use of this adjustable lagging platform the lagging materials were carried in buckets by hand up to the running board, necessitating a great many trips before the job was finished.

Lifting a Driving Box

A device for removing or replacing driving boxes is shown in one of the illustrations. This is a hook arrangement made in tong fashion. It is adjustable, as may be seen, to various size boxes as they do not vary in size enough to exceed its adjustment range. A round T-rod arrangement of 1½-in. diameter hooks under the bottom of the box flange on each side of the box. An extension handle is provided for holding the hook open as it is placed over the box. Boxes are raised by use of this device with an overhead traveling crane.

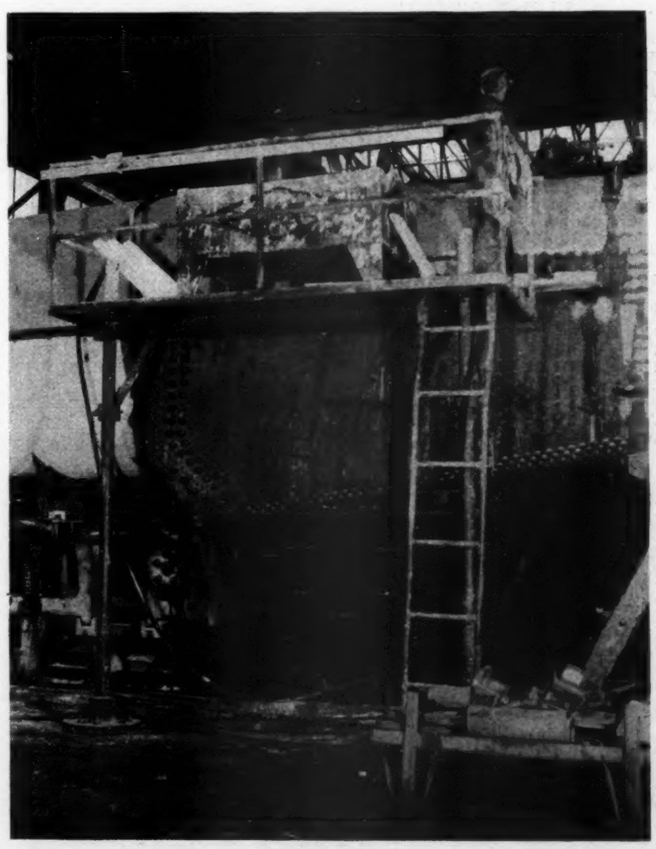
Holding Truck Sides and Boxes for Welding

Another device is a universal jig for holding tender-truck sides while building up worn places and for holding journal boxes while welding on liners. It is constructed as an A-frame from tee iron welded together and is 4½ ft. high. A shaft of 3-in. extra heavy tubing is used as a revolving member, on which a holding frame is welded. This is made of 1-in. by 12-in. wide flat iron. Two set screws, shown at the top in the illustration, are 1 in. in diameter and are used for clamping the truck side frame. The frame may be revolved to four positions and held in place by a pin and disc at the opposite end of the shaft.

On the same A-frame in the lower portion, there is a 2-in. piece of tubing on which is attached a clamp made in a similar fashion as that described above, but smaller, for holding an oil box in a handy position for welding. This can also be revolved to various positions.

Countersinking Grease Holes

On brass floating locomotive rod bushings, countersinking grease holes on the inside was a slow process until the lateral transmission device for driving the tool was perfected. It consists of a frame which attaches to a drill press spindle and which has two small sprockets one at the end where attachment is made to the spindle and the other at the end of the arm which reaches into the bushing. A light drive chain is used driving a small drill from the spindle through the housing. It is in a sense a bicycle chain and sprocket affair, with which



A safe and convenient platform for use in applying lagging

this operation can be performed in a remarkably short time as compared to former hand methods.

Holding Locomotive Rods On a Machine

A holding arrangement shown on the milling-machine table is used in properly holding forged steel side rods on the bed of a milling machine for clevising and tongue cutting. The device holds the rod accurately level and stable and eliminates all chattering of the rod while machining.

The two sides plates and base are made of forged steel and bolted to the machine table by four 1¼-in. bolts, two on each side. The plates are 2 in. in thickness having a filler block at the bottom, where four bolts are used for tying the two plates together at the base. The rod is held in the device by set screws which are 1½ in. in diameter. The block, shown on top of the rod, is of forged steel 2 in. by 4½ in. by 14 in. long, with lips extending over the two side plates and clamped down by two 1¼-in. bolts which serve as a clamp for holding the rod down.

In the photograph, which shows the milling of the tongue end of a rod, a C-clamp is used to hold the rod end firm. The same general clamping arrangement is used also when holding the rod for milling the clevis end. This arrangement holds rods in accurate alinement and obviates cutter breakage frequently encountered with a make-shift arrangement.

Failures of Diesel Engine Parts*

The latest analysis made of the principal origins of failure in accidents to insured Diesel engines shows the following relationship:

Name of part	Percentage of failures
Bearings	30.0
Cylinders (including heads and liners)	24.3
Pistons and piston rings	15.3
Valves	7.3
Crankshafts	4.5
Connecting rods and crankbolts	4.5
Gears	4.5
Fuel pumps and piping	2.8
Governor parts	2.8
Exhaust manifolds	2.3
Accidents not otherwise classified	1.7

These percentages vary slightly from year to year, but there has been a noticeable improvement in the experience with crankshaft, connecting-rod, and crankbolt breakage. This has been due to the breakdown-preventing inspections given insured equipment, and has, of course, been a factor in the most recent compilation of rates.

The highest percentage quoted is that of bearing failures. From an analysis of the loss history of bearings it seems quite significant that the high percentage of bearing failures is definitely connected with piston-scuffing and piston-seizure troubles, a fact which correlates bearing troubles and cooling practices.

The percentage of cylinder-head, cylinder, and liner losses is next and could be lowered appreciably by the installation of closed cooling systems and by the systematic practice of after-cooling every time the engine is stopped. The necessity of safeguarding the cylinder wall against undue localization of heat from the hot piston top at the time a Diesel engine is stopped is not sufficiently appreciated. Many engines always stop in approximately the same position. This may cause the formation of circumferential cracks in the cylinder wall at the point where a hot piston top has repeatedly come to rest. Numerous cases of circumferential cracks in cylinder liners could be traced directly to this cause, particularly where no after-cooling has been used.

As already mentioned, crankshaft breakage is being more effectively prevented nowadays by an improved crack-finding technique and the periodical dismantling of shafts. Whitewash tests give good results and the magnetic method of crack finding is employed where it may give some advantage over the whitewash test.

A very important factor in the improved crankshaft experience has been the use of the Hartford strain gage, developed by the company (Described in The Locomotive, April 1934, page 34). This instrument is placed between the crankwebs and gives a reading of the distortion of the cranks due to misalinement of bearings, improper foundation support of the engine base, the influence of overhung flywheels, or excessive belt tension. From such distortion readings the apparent fibre stress from the bending strains in the cranks can be determined.

Experience has taught that whenever a piston seizure has resulted in the engine being brought to a more or less abrupt stop, it is always advisable to replace the crankbolts of the affected cylinder because of the heavy over-stresses in the bolts caused when all the power in the engine is attempting vainly to continue the seizing piston in motion.

It seems appropriate to mention the company's experience with the repairing of broken shafts and the building up of shaft surfaces by fusion welding. Such repairs have not come up to expectations. Shafts that have been welded should receive dismantled inspections at frequent intervals.

The building up of shaft journals and flywheel seats on shafts has been particularly disappointing in that in so many cases cracks form in such built-up shafts and eventually lead to complete breakage. Such repairs have stood up only from a few months to two or three years.

* Excerpts from an address entitled "Diesel Engine Insurance and Experience" by H. J. Vander Eb, assistant chief engineer, Turbine and Engine Division, Hartford Steam Boiler Inspection and Insurance Company, published in that company's magazine The Locomotive, for January, 1940.

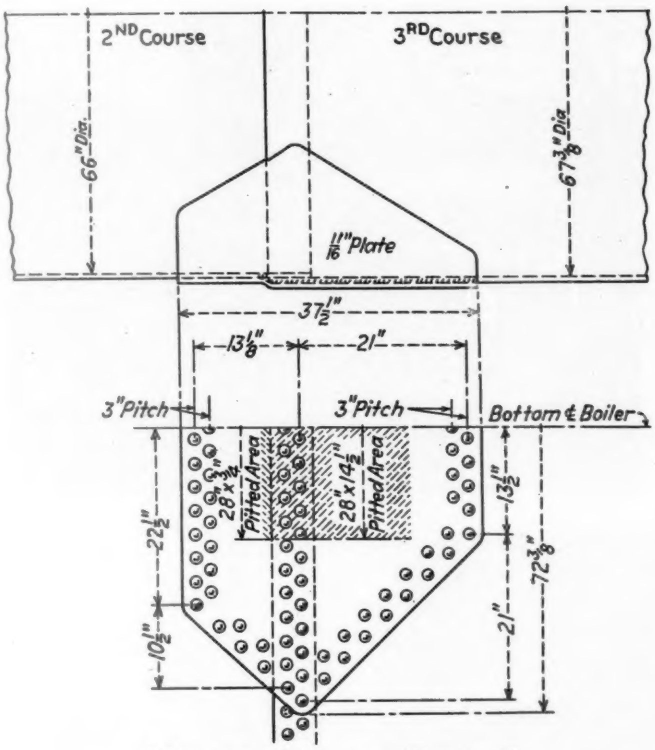
[NOTE—The data and comments in this paper undoubtedly refer to types of Diesel engines other than those common to the Diesel-electric locomotive. Irrespective of the engine type, however, the data, derived from experience, is of interest—EDITOR.]

Boiler Patch To Fit Offset Between Two Courses*

The defect in the boiler shell consisted of a pitted area at the back end of the second course, ¾ in. wide, extending 14⅜ in. into the third course with a width of 14 in. on either side of the bottom center line. A patch of 11/16-in. boiler plate, 37½ in. by 72⅜ in., was designed to repair this defect.

The location of the patch made it necessary to roll the patch plate to two different radii and the following method was used with very good results. A rectangular plate from which the patch was to be formed was cut slightly larger than the size of the desired shape. Two other plates of the same thickness, one 14 in. by 75 in., and the other 22 in. by 75 in., were also cut. The patch plate was placed in the furnace to be heated and while it was heating one 75-in. edge of each of the smaller plates was bevelled to form a smooth, rounded surface. As soon as the patch plate was heated to the desired

* An entry in the prize competition on boiler patches, announced in the March, 1939, issue. The names of the winners were published in the August, 1939, issue.



Boiler patch rolled to two different radii

temperature, it was removed from the furnace and placed in the rolls. Inserting one of the smaller plates beneath and one above the patch plate, the patch was rolled to form two cylindrical surfaces with an offset between them to match the offset between the boiler courses.

When the plate was cold, the holes were laid out and drilled, and the plate was trimmed to the proper size and chipped. The patch was riveted to the shell, after which all rivets and seams were caulked.

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Design of Dry Pipe in Boilers Without Steam Dome

Q.—On locomotives not equipped with a steam dome on top of the boiler, how is the steam taken into the throttle?—G. E. O.

A.—This boiler design, as developed by the Canadian Pacific, consists of eliminating the steam dome and the boot-leg at the end of the dry pipe. Multiple throttles are located in the smokebox. The dry pipe extends back from the front tube sheet to the third course (the boiler course of largest diameter) and is offset so that the top of the pipe is 2¾ in. below the inside of the third course. The end of the dry pipe is sealed by inserting a plate and seal welding all around.

The steam is taken into the dry pipe through a series of slots in the top of the pipe, the slots starting about six inches from the end of the dry pipe. The slots run circumferentially with the pipe and are made 4 in. long ¾ in. wide with 1-in. bridges. The total area of the slots is approximately twice the area of the dry pipe.

The slotted portion of the pipe is enclosed at each end by erecting baffle plates 12 in. wide and extending them up to the inside of the shell. Deflecting plates, running parallel with the pipe, extend out from the ends of the slotted holes to the width of the baffle plates on both sides, the deflecting plates being spot welded to the baffles at each end. The effect of the baffle and deflecting plates is to spread the water-surface area over which the steam rises sufficiently to prevent the lifting of the water and to effect a much steadier level of the water in the water glass.

Double-Spindle Threading Machine

A double-spindle threading machine developed by the Geometric Tool Company, New Haven, Conn., is composed of two units, each of which may be operated independently of the other. This arrangement is said to be economical when the thread being cut is of sufficient length to allow the operator time to unload and chuck one work-holding device while the other unit is cutting. The machine is furnished in three sizes with a complete threading range from 1/16-in. to 1½-in. diameters, cutting National fine-thread pitches only in the larger diameters.

As the units are separate, one thread size may be cut in one unit and a different size in the other. The individual motors permits them to be run at the proper speed for the thread being cut. The cutting lubricant for each unit is supplied by an independent pump, and each is furnished with a chip pan. Either unit may be employed to cut right- or left-hand threads.

The double-spindle threading machine made by the Geometric Tool Company has two units which operate independently

Forming Steel Car Parts

At the Galesburg, Ill., steel car shop of the Chicago, Burlington & Quincy, two bulldozers are used with exceptionally good results in forming steel car parts of many different sizes and shapes. By the use of the proper dies, moreover, these machines are being used in making certain parts which it was formerly thought could be formed successfully only under hydraulic presses of large size. The larger bulldozer, a Williams & White No. 29 machine with a main header 9 ft. long by 37 in. high, is equipped to make large pressings with dies which actually extend a limited distance above the top face of the header. The dies usually consist of Grade B cast iron, made at West Burlington shops, although some built-up dies are fabricated by welding at Galesburg shop. The production of car parts is usually

Above: Cast-iron dies used in the No. 29 bulldozer for making crossbearer diaphragms — Left: Fabricated steel dies used in making the bottom angle of hopper-car center partitions — Below: Special dies, large furnace and No. 29 bulldozer at the Galesburg steel car shop of the C. B. & Q.

higher than that obtained with hydraulic presses owing to the more rapid power stroke of the bulldozer.

Two pairs of dies are shown in the foreground of the upper illustration. The furnace for heating steel sheets is shown in the left background and the No. 29 bulldozer at the right. The upper pair of dies is used for forming side stakes and the lower dies for longitudinal hood sheets used in steel hopper-car construction.

The fabricated steel dies used in making the bottom angle of the center partition for cement hopper cars are cut out on the Oxygraph gas-cutting machine to the shape indicated and have reinforced plates applied by welding. The male die is illustrated at the left on steel horses and the female die is shown at the right on the ground. These dies are 9 ft. 4 in. long by 15 in. wide and the shelf consists of old arch bars, joined by welding to form a 4-in. by 4½-in. cross section. The dies are used in the No. 29 bulldozer and the piece is formed hot in one operation of the bulldozer.

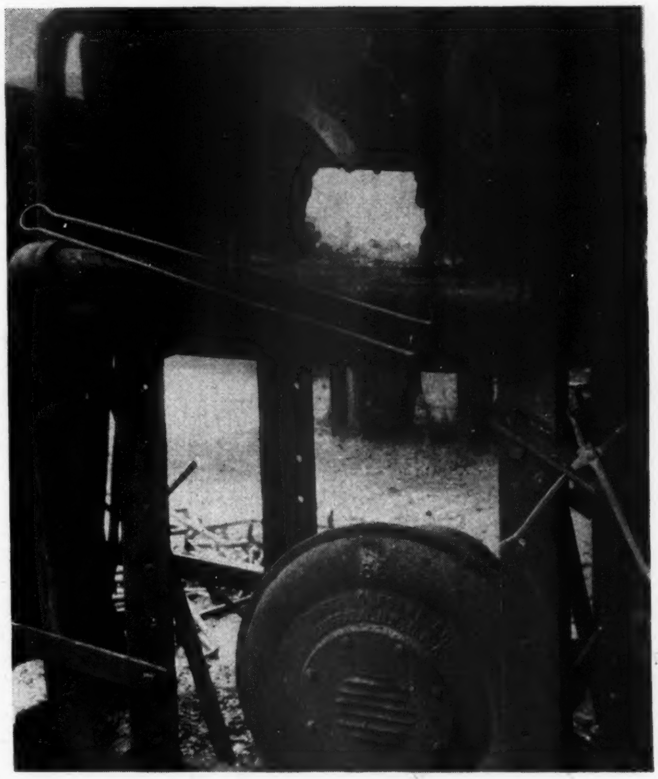
In making the crossbearer diaphragm the dies shown in the background of the middle illustration are used in the No. 29 bulldozer. These crossbearer diaphragms are made of 5/16-in. sheet steel and are 50⅞ in. long by 35 13/16 in. high. The female die, shown next to the diaphragm, is a combination right and left die, cast in one piece and machined to the shape indicated with a center slot in the left end through which the completed diaphragm may be released from the die. Right or left male dies are required, depending upon which diaphragm is desired. With the dies properly and rigidly fixed in the bulldozer, a hot sheet previously cut to the desired shape by stack flame cutting in an Oxygraph machine is removed from the furnace, correctly positioned against the female die which is bolted to the stationary bolster, and the diaphragm is pressed hot in one operation by a single stroke of the male die which is rigidly bolted to the header ram. On the return stroke, a small bar inserted between the pressing and the stationary die serves to strip the diaphragm from the movable die and it can be readily removed through the slot provided for that purpose in the side of the stationary die.

Air Screen Protects Rivet Heater

Two different types of tongs, commonly used in connection with riveting work at railway steel car shops, are shown in the illustration. The long rivet tongs are used for removing hot rivets from the furnace and also, when necessary, for throwing rivets a short distance to the riveting position, whether at ground level or on the overhead structure of an adjacent car. The riveter's helper then uses the short "sticking" tongs, shown at the right in the illustration, to place each rivet in the desired hole ready for riveting.

Both of these tongs may be used for the easy handling of rivets with one-hand operation. The feature of the long tongs is that they are made of a brake-cylinder coil spring, heated, stretched out to the required length for 36-in. tongs, and having the ends forged and bent, as shown in the illustration, to fit around a rivet. Being made of spring steel, these tongs require no heat treatment and have just enough spring to be easily used in handling rivets with one hand.

Incidentally, the type of rivet-heating furnace illustrated, utilizes a highly effective method of protecting the operator from the heat of the furnace. It will be noticed that a steel baffle plate is set out about 4 in. from the face of the furnace wall, just even with the top of the door, and a 2-in. perforated air pipe, just under the door, directs a blast of air upward along the exterior furnace wall with sufficient force to entrain the hot furnace gases and direct them upward between the furnace wall and the baffle plate. This construction gives almost complete protection to the operator from hot air and gases and leaves him exposed to only a relatively small amount of radiant heat from the furnace.



Rivet-heating furnace and special tongs used in handling rivets

Decisions of Arbitration Cases

(The Arbitration Committee of the A. A. R. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Repairs Permissible After Extended Period

On June 18, 1936, a St. Louis-East St. Louis information card was issued by a car inspector of the New York, Chicago & St. Louis against the Mobile & Ohio on St. Louis-San Francisco car 127154. The defects enumerated were "two metal center sills bent in excess of 2½ in. between body bolsters, A end." On February 24, 1937, the St. Louis-San Francisco sent this information card to the M. & O. with the request that in accordance with A.A.R. Rule 4, paragraph 1, statement be furnished showing how damage occurred or, if unable to do so or if damage occurred in unfair usage, to furnish defect card. On April 13, 1937, the M. & O. forwarded to the St. L.-S.F. a defect card covering the defects. In May, 1937, bill the St. L.-S.F. rendered a charge of $496.46 for repairs made to this car at its Springfield,

Mo., shop on authority of M. & O. defect card. The M. & O. took exception to the charge, contending that it was excessive and that the extent of repairs was no doubt due to the car remaining in service over a period of several months with the sills bent, during which it had made 23 interchange and 26 line movements. Due to its inability to show the circumstances of the damage and upon the assumption that the information card had been issued in accordance with A.A.R. rules and the rules of the St. Louis-East St. Louis Superintendent's Association, the defect card was issued. In the opinion of the M. & O., subsequent investigation revealed that the defect card had been erroneously issued. The St. L.-S.F. stated that if there was any question regarding the validity of the information card, the M. & O. should have settled it prior to issuing the defect card and the rules provide that defect cards cannot be repudiated. It contended that the period of time between the issuance of the information card and the date the car was repaired had no bearing upon the responsibility for damage to the car and that there was no evidence that the sills were further damaged between the date the information card was issued and the date the car was repaired. It stated that the defects were impossible to repair without dismantling the affected parts and, in this instance, some of the affected parts of the center-sill assembly could not be straightened and reused. All other parts charged for were removed, replaced, or renewed to gain access to the damaged parts covered by the defect card.

In a decision rendered November 16, 1939, the Arbitration Committee stated: "The road causing the damage had the option of making repairs instead of delegating the work by the defect card. Rule 5 prescribes the period within which the carded defects must be repaired after the car reaches the home line to justify the bill. A defect card issued under the circumstances has the same status as any other defect card. The contention of the car owner is sustained."—*Case No. 1772, Mobile & Ohio versus St. Louis-San Francisco.*

Axle Not Condemnable—May Not Be Changed at Owner's Expense

On December 30, 1937, St. Louis-San Francisco car 130112 was repaired at Peoria, Ill., by the Toledo, Peoria & Western. The repairs consisted of applying two second-hand cast-steel wheels on a second-hand axle, two new journal bearings, four new box bolts and four new nut locks. The primary reason for making repairs was a defective L-3 journal. The billing repair card of the T. P. & W. in the "why made" column showed "journal damaged by flange of other wheels. Will true." Under "repairs made" column, in addition to a list of the repairs, was a notation "journal has several deep dents indicating journal had been applied to the car in this condition." A charge was rendered against the St. L.-S.F. for differences in value between one second-hand and one scrap wheel and for the value of new parts applied as previously listed. The St. L.-S.F. took exception to the charge, contending that this defect was a handling-line responsibility while the T. P. & W. contended that this defect was the owner's responsibility. In its statement the St. L.-S.F. listed the interchange movements of this car between December 22 and December 29. They contended that if the journal was cut or damaged or showed signs of heating when received from the connection, the T. P. & W. should have protected itself in interchange. The St. L.-S.F. stated that its records did not indicate when these wheels were applied but they had apparently been under this car for several years and if the defect on the journal was caused prior to the application of the wheels, as claimed by the T. P. & W., trouble would have been experienced immediately after application. The T. P. & W. stated that the three indentions in the journal varied from 1/16 in. to 1/8 in. deep by 1/2 in. wide to 1 in. long. There were no indications on the brass or journal of overheating or damage caused by overheating, but this road decided that inasmuch as this journal was actually cutting the brass, it was unsafe for movement in a train and the proper procedure was to change the wheels. Since the journal did not show any signs of heating, it could not request the delivering line to furnish defect cards and as they felt the journal was unfit for service in this condition, the wheels were removed.

In a decision rendered November 16, 1939, the Arbitration Committee stated: "As the journal had given no trouble and the axle otherwise was not condemnable under Rules 84, 85 or 86, the Toledo, Peoria and Western may not change the axle at the expense of the car owner. A charge, however, is proper against the St. Louis-San Francisco for journal bearing condemnable under Rule 66."—*Case No. 1773 St. Louis-San Francisco versus Toledo, Peoria & Western.*

Bethlehem Develops High-Carbon Tool Steel

A new tool steel, marketed under the name of Red Tiger, has recently been developed by the Bethlehem Steel Company, Bethlehem, Pa. It is a special high-carbon, high-vanadium tool steel suitable for a wide variety of uses ranging from heavy hogging cuts to fine finishing operations. This steel represents a departure from standard practice as the carbon content has been markedly increased to produce extra hardness, averaging from 65C to 68C Rockwell, attained without producing excessive brittleness. The impact properties of this steel, as shown by physical tests, are approximately the same as those of standard carbon 18:4:1 high-speed steel.

Its fine shock-resisting properties permit this steel to be used on intermittent cuts without danger of breakage.

Taking heavy cut on 30-in. car wheel using Red Tiger tool steel made by Bethlehem Steel Company

Due to its high carbon content, it also is adaptable to fine finishing operations, producing a surface comparable with that obtained when using the old type of finishing steel which could only be employed in low-speed cutting. Good red hardness values allow it to take heavy hogging cuts.

The analysis of Red Tiger tool steel is approximately as follows: tungsten, 18 per cent; chromium, 4 per cent; vanadium, 2.5 per cent; molybdenum, .60 to .80 per cent, and carbon, 1 per cent. Standard heat treatment is used without any extra precautions. The following treatment is recommended: Preheat the steel slowly to between 1,500 and 1,650 deg. F. and soak thoroughly. Transfer to the hardening furnace, heat rapidly to between 2,350 and 2,375 deg. F., and oil quench immediately to about 200 deg. F. Allow it to cool to room temperature, charge into a tempering furnace and draw to 1,050 deg. F. If followed properly, this procedure will give a Rockwell hardness between 65C and 68C.

The principal applications of this tool steel is in making roughing and finishing cuts for all general purposes and for machining materials such as heat-treated railroad car wheels and axles, cast iron, and heat-treated alloy steel. In machining heat-treated car wheels, a speed of 16 ft. per minute has been used with a 7/16-in. depth of cut and a 7/16-in. feed. It is supplied as bar stock, heat-treated tool bits (furnished in a ground condition only), and turning plugs used with special tool holders.

Welding Positioner

The Cullen-Friestedt Company, Chicago, manufacturer of car pullers, has recently developed and placed on the market a tool of primary interest in the welding field because it enables positioned welds to be made quickly, economically and with maximum safety for the welding operators. The C-F welding positioner consists of a substantial base plate and vertical post on which is mounted a table capable of being revolved in either a horizontal or a vertical plane. The maximum vertical angular movement is 135 deg., or 45 deg. beyond the vertical and the table can be rotated through a full circle regardless of the angle at which it is tilted. This combination makes it possible to position all welds properly for down-hand welding without rehandling the work.

Tilting and rotating movements of the table are independently controlled. On hand-operated machines, tilting and rotating movements are each operated by independent hand wheels through self-locking gearing. Power-operated positioners are driven by independent motors, also self-locking, for tilting and rotating.

The mechanism for rotating the table can be disengaged (on hand-operated machines only) so a balanced or circular job can be easily rotated by the welder, from any position, without using the hand wheel. The height of the table is adjustable to various positions as required and for large jobs a standard positioner can be mounted on a table to give additional height. The table is removable so special fixtures can be attached to the head.

The C-F welding positioners are available in three sizes to accommodate work weighing 2,500 lb., 6,000 lb., and 14,000 lb., respectively. The 2,000-lb. machine can be furnished for hand operation or equipped with power for tilting or rotating, or both. Constant-speed rotation or variable-speed rotation is optional. The two larger machines are fully powered for tilting and rotating.

While this type of welding positioner is adaptable for use in fabricating locomotive pilots, air-pump brackets,

Typical welding job on a Cullen-Friestedt power-operated welding positioner

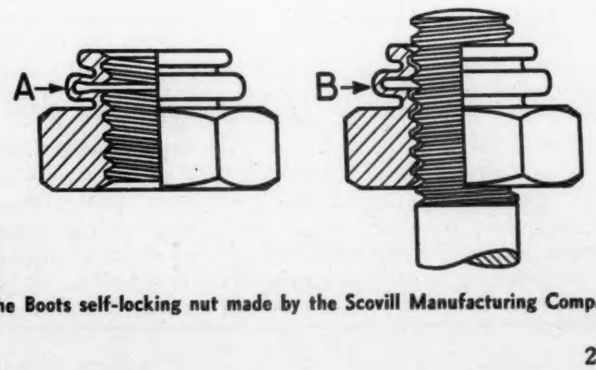
gas-engine heads, etc., its primary adaptation in the railway field is for the fabrication of such car parts as truck or body bolsters, underframe sub-assemblies, end frame sections, welded truck side frames and any number of similar details which are made primarily of structural-steel plates joined in a unit structure by welding.

Effective One-Piece Self-Locking Nut

The Boots self-locking nut is an all-metal nut designed to withstand the most severe vibration. It is essentially two nuts in one with the top section displaced downward so that the upper (locking) threads are out of lead with respect to the load-carrying threads of the lower section. The two sections are connected by a spring member which is an integral part of the nut. Upon the insertion of the bolt, the spring member allows the top section of the nut to be extended to permit its proper engagement with the threads of the bolt. A force is thus established which firmly grips the nut without damage to the threads of the bolt and accommodates all thread variations.

In the diagram, *A* shows the spring member in its displaced position when not engaged with a screw or bolt. The position of the spring member, when the nut is engaged, is shown at *B*. Both diagrams are exaggerated to show the principles involved.

These nuts are made with standard threads and at present are available in sizes from No. 8 to 3/4 in. in a variety of metals. Additional sizes and types are under development. They are produced and distributed by the Scovill Manufacturing Company, Waterbury, Conn.



The Boots self-locking nut made by the Scovill Manufacturing Company

THE READER'S PAGE

Diesel versus Steam

To the Editor:

I am interested in the discussions on Diesel-electric locomotives appearing in the *Railway Mechanical Engineer*. It would seem that the efficiency of the Diesel is being judged more from a thermal and mechanical standpoint when comparing it with the steam locomotive. The ultimate efficiency of any prime mover is its ability to perform a given job with the lowest outlay of money. In this respect the modern steam locomotive ranks high. In the matter of fuel economy, the Diesel is undoubtedly way ahead of the steam locomotive, but when one takes into consideration that the first cost of the Diesel is about three times as much as a steam locomotive of like power, it would seem that the fixed charges on the higher priced Diesel will nearly nullify this advantage. Fuel prices vary over 100 per cent in different parts of the country for steam locomotives and Diesel fuel will no doubt continue to rise with increasing demand, so that the Diesel's greatest advantage is subject to quite a variation in different localities.

As to availability, there are modern 4-8-4 type engines which have an availability of 93.4 per cent, and have shown a return in one year of over 50 per cent on the investment. Train schedules usually determine the monthly mileage that these modern units can make.

One of the claims for the Diesel is that it can be utilized nearly 24 hours a day without going to the enginehouse for servicing. Facilities can be provided at moderate cost, whereby the steam switcher can be serviced to stay out until due for a washout.

It would seem that a thorough analysis of conditions in each individual case is necessary, remembering that what may be successful on one road will not necessarily be so on another.

A Reader

Unit Pressures Allowable On Oil-Lubricated Bearings

To the Editor:

In the February issue of the *Railway Mechanical Engineer* E. C. Pearce has an article dealing with the subject "Journal Box Temperature." I presume he is using one box and one 5½-in. by 10-in. journal as the waste, and oil, would be about right for one box, and yet he states that the weight, or load, used was 20,000 lb. which according to his figures, was 890 lb. per sq. in. of actual bearing surface. The 20,000 lb. per journal, and I judge that means 40,000 lb. per axle, seems about the nominal capacity for such axles, but it has always been my belief that when you loaded a standard journal bearing in excess of 400 lb. per sq. in. you were reaching the limit at a speed of 50 m. p. h. as the oil film would break down.

W. C. Fox

[The unit pressure of 890 lb. per sq. in. was given as the unit load on each square inch of projected actual bearing area. If the 20,000-lb. load was distributed over the projected area of the entire surface of a 5½-in. by 10-in. journal, the unit pressure would be reduced to about 364 lb. per sq. in., but would include an area which is not fully effective for load-carrying purposes. This is the basis on which unit bearing pressures are usually calculated and on which they are rated.—*Editor*]

Preventing Boiler Explosions Due to Low Water

To the Editor:

I have read the editorial entitled "Boiler Explosions" in your February, 1940, *Railway Mechanical Engineer* with much interest. This editorial is very well prepared and I am glad to note that you are interested in the prevention of boiler explosions.

From your analysis, you assume that the last three years' experience implies that an irreducible minimum of boiler explosions caused by crown-sheet failures due to lower water in which no contributing causes or defects are found has been reached at about four or five per year.

Accidents of this kind are, as you state, an exceedingly old story; and while, as you mention, a minimum of four or five per year in operations involving over 40,000 locomotives scattered over the United States might be considered as highly satisfactory, provided there were no preventative.

The Southern Pacific Lines have now completed eight years of operation of steam locomotives protected by the multiple application of boiler drop plugs, and notwithstanding that we have experienced during this period 123 cases of low water, we have not experienced a single case where a boiler drop plug failed to function and give the necessary protection; neither have we had a boiler explosion or a burnt crown sheet or serious damage to a locomotive boiler due to low water.

Our eighth annual report, under the heading "Boiler Drop Plugs—Record of Application and Performance," shows that on the Pacific System, covered by this tabulation, the minimum number of cases of low water in any one year was seven, while the maximum was 33. It is also interesting to notice that the responsibility for low water is very evenly divided between engine crews and yard and roundhouse forces. In this connection, an analysis shows that in 76.4 per cent of the cases where low water was experienced, the only repairs necessary to put the engine back into service was to renew the drop plugs.

We have gone a little farther back in our summary of boiler explosions due to lower water, as reported by the Bureau of Locomotive Inspection, and a summary of boiler explosions resulting from crown-sheet failures during the past eight years shows an average of seven boiler explosions per year with an average of 9.1 persons killed and 15.8 persons injured. This represents 62.9 per cent of the total fatalities from locomotive operation.

I feel that our eight years' experience with the use of boiler drop plugs proves quite conclusively that boiler explosions caused by crown-sheet failures due to low water can be prevented.

Frank E. Russell,
Mechanical Engineer, Southern Pacific.

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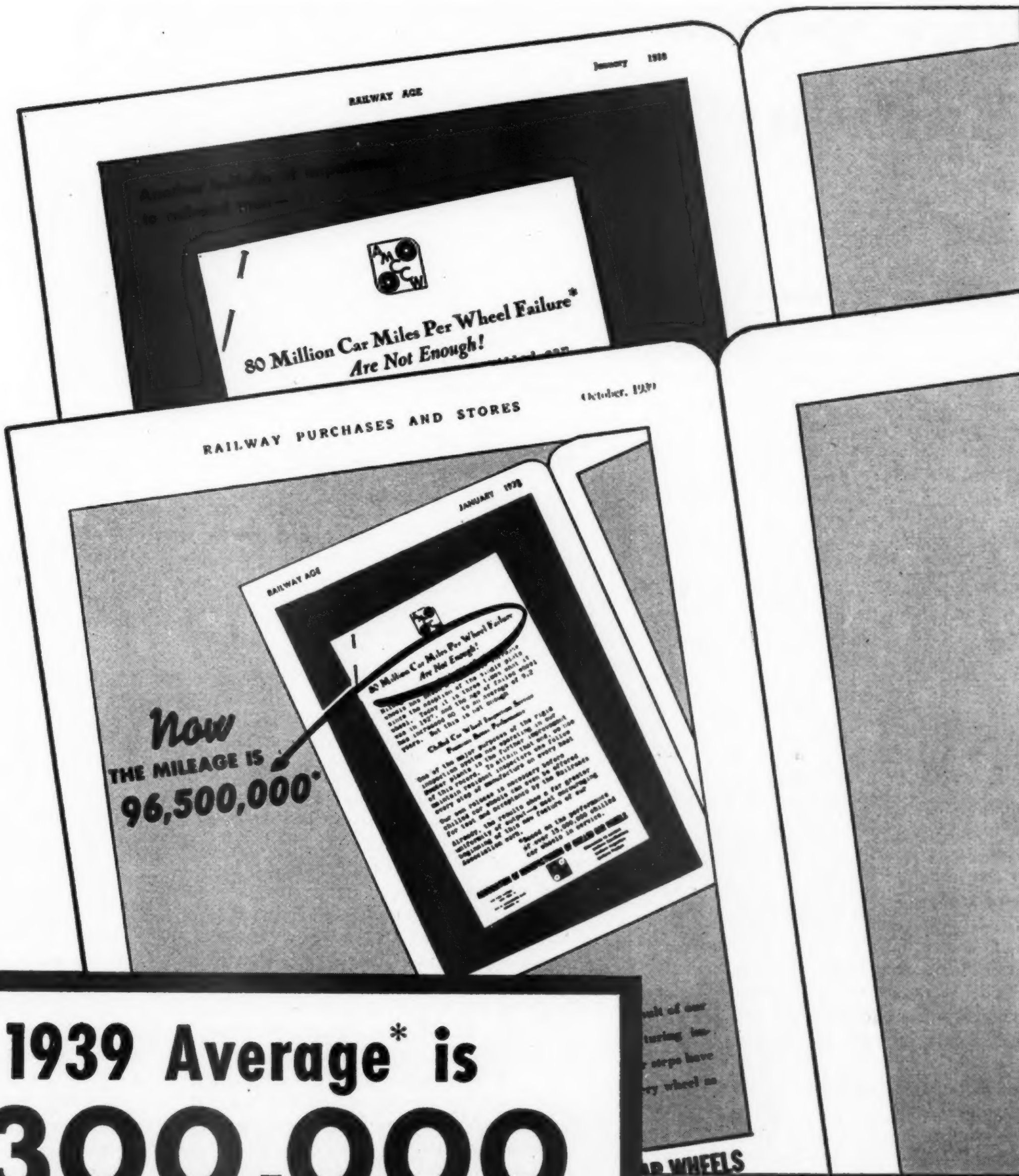
RAILWAY AGE
January 1939
80 Million Car Miles Per Wheel Failure*
Are Not Enough!
RAILWAY PURCHASES AND STORES
October, 1939
Now
THE MILEAGE IS
96,500,000*

High Spots in

Railway Affairs . . .

Sold Down the River!

The Transportation Bill of 1940 (S. 2009) was given most painstaking consideration over a period of a year and a half in the House and the Senate, and by the conferees. It is doubtful if any single piece of legislation has received more thorough discussion and study by Congress. It was all set for final passage and to be sent to the President for approval; indeed, it looked as if these processes would be almost automatic and that within a few days the bill would be enacted. To the surprise and consternation of members of Congress and friends of the railroads, a totally unexpected brazen foray or blitzkrieg was made upon it, as the result of which it was recommitted, apparently to suffer an ignominious decease. Who is responsible for this outrageous procedure? Surely not a friend of the workers on the railroads, or of the investors in railroad securities. Certainly not the managers, who have been fighting with their backs to the wall to put the properties back on their feet. Who, then, is responsible? Apparently the leaders of the five transportation brotherhoods, together with certain large businesses which ship extensively by inland waterways and principally at the expense of the taxpayers of the United States. It is well known that the public does not profit by such shipments, since the difference between the costs of shipping by water and by rail is pocketed by the shippers. Just what sort of bargain was made by the brotherhood leaders is not known. Presumably they were promised some assistance in enacting legislation in the future to promote such things as train limit, full crew and other "make work" bills.

Misleadership

We do not believe that any large proportion of the members of the transportation brotherhoods are sympathetic with the action taken by their leaders in sabotaging S. 2009. When this traitorous action was taken, the leaders of the 13 other railroad brotherhoods, which represent over 75 per cent of the railroad employees, immediately took steps to do everything they could to offset the steps taken by the five brotherhood leaders. We salute them for their courage and good sense. At the same time we urge the members of the transportation brotherhoods to call their leaders to account. Incidentally, it would appear that these leaders—as they have studied the reaction—are very much worried over the action that they took. It is quite apparent, also, that the transportation committees of Congress are pretty well fed up on the barrage to which they have been subjected by the high pressure groups. They are disgusted too with the action of the brotherhood leaders and are not inclined to take further steps at this session unless pressure is brought on them.

Eastman's Advice to Railroad Employees

One of the snags that did much to slow up progress in transportation legislation in Congress, was the fact that one of the labor organizations insisted that there be no consolidation or unification of the railroads which would result in unemployment or displacement of any carrier employees. In an address which Chairman Eastman of the I. C. C. made before the Western Railway Club on May 20, he pointed out that, "It is clearly unsound and contrary to the best interests of the country to compel wasteful work to be performed, anyhow, or anywhere, at any time, and it is particularly perilous to all concerned, including the employees, to apply such doctrine to the railroads under present conditions. It is like putting lead in the saddle of a race horse. The railroads are in a race with their competitors. They have already lost a tremendous amount of traffic, and to the extent that they are handicapped by the weight of useless labor they will lose more or fail to regain what they might otherwise recover. No fiat of law can prevent the shrinkage of operations which results from loss of business or the reduction in employment which is the natural consequence of such shrinkage, and the railroad employees have had ample reason to know that this is so. So far as expansion of employment is concerned, they have, in my judgment, more to hope for in the long run from an increase in the economy and efficiency of railroad operations than from any other one factor, with the exception of a general increase in the business and prosperity of the country as a whole."

Vacations with Pay

The standard railroad labor organizations, through the Railway Labor Executives' Association, have started a drive to secure vacations with pay for their members. The conditions of employment in the various brotherhoods differ so greatly that two proposals are being worked out, one by the five transportation brotherhoods—the engineers, firemen and enginemen, conductors, trainmen and switchmen—and the other by 14 of the other unions. The train dispatchers are not participating because they already have vacations with pay. It is significant that "Labor," in announcing this new drive, precedes it with a bold type announcement to the effect that rail legislation is not dead in Congress; it is simply slowed up, so it says, because Senator Burton K. Wheeler, chairman of the Senate Committee, is attending to his political fences in Montana, while Congressman Lea is trying to clean up a heavy accumulation of business which was piled up because of the great amount of attention that he was forced to give to S. 2009 and the conferences concerned with it. Labor, in its issue of May 21, optimistically estimated that the decks would be cleared up within a week or 10 days, for further action on S. 2009 by the conferees.

Eastman's Subsidy Report

The long-awaited report of the former Federal Co-ordinator of Transportation on government aids to the various forms of common carrier transportation was finally made public on April 15. It comes to the somewhat astonishing conclusion that in 1936 only about $8,000,000 of government aid was given to motor vehicle transportation, as compared to $21,453,000 to air transportation, $35,635,000 to the railroads and $128,528,000 to water transportation. The "nigger in the woodpile" lies in the fact that a formula was used which, in effect, assigned about 60 per cent of the highway costs to the general taxpayer and only about 40 per cent to the users of the highways—of which, of course, the common carriers using the highways for intercity traffic are only a part, so that still other assumptions had to be made as to the distribution of the 40 per cent between the various classes of motor vehicles. Incidentally, the $35,635,000 assigned to the railroads includes an item of $26,000,000 calculated on the basis of savings in interest and other financial charges which would have been involved in borrowing money in the regular money markets, rather than from the R. F. C. and the P. W. A. Quite naturally the railroads disagreed emphatically with Mr. Eastman's findings. J. J. Pelley, president of the A. A. R., in appearing before the Temporary Economic Committee, pointed out that the railroads actually contributed more than $35,000,000 a year to the construction and maintenance of highways, through the payment of taxes on their property, and this, in fact, is only a small part of the contribution that they make to public welfare through the payment of taxes. Moreover, he said that "the taxes collected from these motor trucking companies are small, indeed, compared with the burdens which their operations impose upon the highways and others who use them." Apparently Mr. Eastman has stirred up a real hornet's nest.

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Among the Clubs and Associations

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—The semi-annual meeting of the American Society of Mechanical Engineers will be held at the Hotel Pfister, Milwaukee, Wis., June 17, 18 and 19. That part of the program of particular interest to the railroad membership is as follows:

Monday, June 17

MORNING

Education and Training

Encouragement of Creative Ability, by John E. Ryan, and A. R. Stevenson, Jr., General Electric Company

The Employer Suggests Needed Improvements in Our System of Technical Education, by W. H. Carrier, chairman of the board, Carrier Corporation

Selection of Men with Creative Ability, by Alexander Magoun, Massachusetts Institute of Technology

Thursday, June 20

MORNING

Railroad Symposium

Steam Locomotives—Notes on Their Ages and Proportions, with Suggestions for Improvements, by J. L. Ryan, St. Louis-San Francisco

Notes on the Trends in Reciprocating Valve Mechanisms Employing Piston Valves, by Chas. F. Krauss, assistant chief engineer, Baldwin Locomotive Works

Notes on Valve and Valve Motion Design for Modern High-Speed Passenger Steam Locomotives, by A. G. Hoppe, assistant mechanical engineer, Chicago, Milwaukee, St. Paul & Pacific

Notes on the Measurement of Cylinder Power of High-Speed Passenger Locomotives—Apparatus and Methods, by L. K. Botteron, engineer of road tests, Union Pacific

Train Acceleration and Braking, by R. Clark Jones, Research Laboratory of Physics, Harvard University (To be presented by title).

WESTERN RAILWAY CLUB.—The following officers were elected at the annual meeting and dinner at Chicago on May 20: President, O. N. Harstad, general manager of the Chicago, Milwaukee, St. Paul & Pacific; first vice-president, W. W. Kelly, general purchasing agent of the Atchison, Topeka & Santa Fe; second vice-president, C. M. House, superintendent of motive power and equipment of the Alton; treasurer, J. W. Fogg, vice-president and general manager of the MacLean-Fogg Lock Nut Company, and executive secretary, W. L. Fox, general superintendent of the Belt Railway of Chicago.

A. A. R. MECHANICAL DIVISION.—The eighteenth annual meeting of the Association of American Railroads, Mechanical Division, will be held in the South Ballroom of the Stevens Hotel, Chicago, on Thursday and Friday, June 27 and 28. The meeting will convene at 9:00 a. m. each day and will adjourn at 5:00 p. m. on June 27 and as soon as the program is completed on June 28. Members are urged to be in their seats promptly at 9:00 a. m.

Extract from Section 10 (a) of the Mechanical Division, Rules of Order: "It shall also be the duty of the Committee on Subjects to receive from members questions for discussion during the time set apart for that purpose. That committee shall determine whether such questions are suitable ones for discussion and, if so, shall report them to the Division."

The Committee on Subjects will be appointed by the chairman at the opening session on Thursday, June 27, to receive from members questions for discussion. This Committee on Subjects will determine whether such questions are suitable ones for discussion and, if so, will report them to the Division at an appropriate time for discussion by the members. Members are requested not to start discussion on subjects at the sessions of the meeting which have not been first referred to the Committee on Subjects.

Members should be sure to register each day as they enter the meeting. There will be no badges used. Committee reports shall be limited in their presentation to a brief summary of their principal features. By presenting papers and reports as briefly as possible the maximum of time will be available for discussion. The members are urged to study carefully the advance copies of reports and papers and to be prepared to discuss them intelligently.

ANNUAL MEETING PROGRAM

Thursday, June 27

Address by C. H. Buford, vice-president, Operations and Maintenance department, Association of American Railroads

Address by Chairman F. W. Hankins, assistant vice-president and chief of motive power, Pennsylvania

Action on Minutes of Annual Meeting of 1939

Appointment of Committee on Subjects, Resolutions, Etc.

Unfinished business

New business

Report of General Committee

Report of Nominating Committee

Discussion of reports on:
- Lubrication of Cars and Locomotives
- Wheels
- Brakes and Brake Equipment
- Couplers and Draft Gears
- Tank Cars
- Loading Rules
- Car Construction

Friday, June 28

Educational Film—"Know Your Money"—United States Secret Service—Treasury Department

Report on "Intercrystalline Cracks in Locomotive Boilers," by W. C. Schroeder, A. A. Berk, and R. A. O'Brien, presented by Dr. W. C. Schroeder, senior chemical engineer, Eastern Experiment Station, Bureau of Mines, College Park, Md.

Discussion of reports on:
- Arbitration
- Prices for Labor and Materials
- Specifications for Materials
- Locomotive Construction
- Closing Exercises
- Adjournment

AMERICAN SOCIETY FOR TESTING MATERIALS.—W. M. Barr, chief chemical and metallurgical engineer of the Union Pacific at Omaha, Neb., has been nominated for president of the A. S. T. M. H. J. Ball, professor of textile engineering, Lowell Textile Institute, has been named for vice-president. Among the nominees for the Executive Committee are P. D. Merica, vice-president and director, International Nickel Co., Inc., New York, and Jerome Strauss, vice-president, Vanadium Corporation of America.

Club Papers

Braking Trains Under Modern Conditions

Car Foremens Association of Chicago. Meeting held Monday evening, May 13, at the Hotel LaSalle, Chicago. Address, "Braking Trains Under Modern Conditions," presented by L. K. Sillcox, first vice-president, New York Air Brake Company, Watertown, N. Y. ¶Mr. Sillcox departed from his prepared address and talked extemporaneously in explaining a series of lantern slides which depicted in spectacular fashion some of the more important problems and accomplishments in the field of modern high-speed braking. He described the development and primary functions of the "AB" brake, as well as brake equipment developed especially for lightweight, high-speed passenger trains. He referred to the exacting requirements of modern wheel service and stressed the possibilities of disc-type brakes in removing the braking load from car wheels. The importance of large diameter wheels, anti-wheel-sliding devices and improved sanding equipment for individual wheels was also stressed. ¶With reference to the introduction of various new types of air brake equipment and improved features of design to meet modern requirements, Mr. Sillcox said: "No one knows better than the manufacturer the extent to which the success of his designs, and, many times, even his reputation are in the hands of the men who must keep his product in service, once he has done his best work upon it before it leaves his inspection table. You are our employers and without your sympathetic co-operation, our lot would be hard. It is a privilege to acknowledge a debt of this sort. The men who direct and perform the operations which make the equipment of railways imposingly safe and reliable are contributing in no small measure to the improvement of service and to the ability of their administrations, beleaguered by as trying a set of conditions outside their control as can well be conceived, to sustain and improve the prestige of the industry. In return for your faithful service to our products in the field, we, as brake manufacturers, are ever eager to assist in improving your understanding of the parts which we place in your hands and to explain the reasons for their taking the forms in which you find them."

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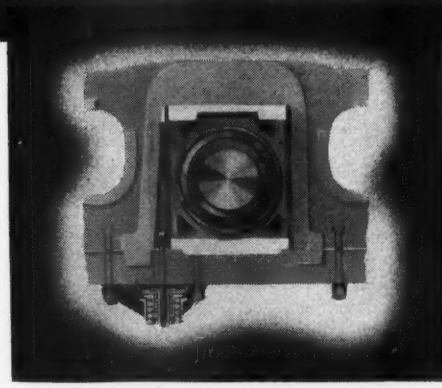
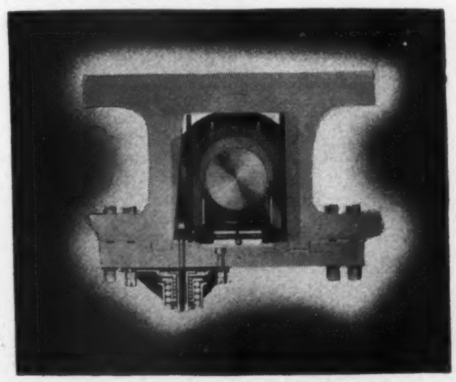
Protect your mallets . . .



. . . WITH FRANKLIN AUTOMATIC COMPENSATORS AND SNUBBERS

Mallets, because of the large number of drivers, formerly meant multiplied troubles because of improperly adjusted driving box wedges. This condition no longer bothers the progressive railroads as they now keep their wedges adjusted automatically and correctly . . . with Franklin Automatic Compensators and Snubbers. » » » The Automatic Compensator and Snubber maintains a constant accurate adjustment. It compensates for wear and for quick changes in temperature, which in many cases varies as much as 250 degrees in short periods of time. Slack & Pound are eliminated and the destructive effect of abnormal shocks is prevented. » » » Wedge adjustment worry is a thing of the past, even on Mallets. Our engineers will be glad to consult with you on applying Franklin Automatic Compensators and Snubbers to your new or old power.

ABOVE: Franklin Automatic Compensator and Snubber for Roller Bearing Driving Box application. **BELOW:** Franklin Automatic Compensator and Snubber for Friction Bearing Driving Box application.



FRANKLIN RAILWAY SUPPLY COMPANY, INC.

NEW YORK
CHICAGO
MONTREAL

NEWS

William E. Woodard Awarded Henderson Medal

At its Medal Day exercises at Philadelphia, Pa., on May 15 the George R. Henderson Medal was awarded by the Franklin Institute to William E. Woodard, vice-president in charge of design, Lima Locomotive Works, Inc., New York. This medal is awarded for distinguished contributions in the field of railway engineering, and it was presented to Mr. Woodard "in consideration of his accomplishments in locomotive engineering and his important contributions in the field of steam locomotive design."

Dickerman and Hardy Elected to Ordnance League Posts

The New York Post, Army Ordnance Association, elected a panel of officers at its recent annual meeting, which included W. C. Dickerman, chairman of the board, American Locomotive Company, as director of the association and as a member of the Executive Committee, together with C. J. Hardy, president, American Car and Foundry Co. The association is a national society of citizens pledged to industrial preparedness, and was founded in 1919 to foster an understanding of industry's role in national defense.

Berwick Plant Celebrates Its Centennial

The Berwick, Pa., plant of the American Car and Foundry Company, a plow factory in 1840, now the company's largest car-building plant, celebrated its centennial on May 4 with events culminating in a dinner given by the Berwick Historical Society at the Hotel Berwick. "Industry and Education" was the theme of the double centennial of the beginning of industry in Berwick and the founding of education in the Berwick Academy, also in 1840. Addresses were made by Governor Arthur H. James of Pennsylvania, Judge E. Foster Heller of Wilkes-Barre, Pa., and President Charles J. Hardy of the American Car and Foundry Company.

In his address President Hardy said that $111,000,000 had been paid out in wages at the Berwick plant since the American Car and Foundry Company was formed in 1899 and that during this same period 230,000 railroad cars had been built at Berwick.

R. L. Templin Awarded Longstreth Medal

The Edward Longstreth Medal for the encouragement of invention was awarded by the Franklin Institute to Richard L. Templin, chief engineer of tests, Aluminum Company of America, New Kensington, Pa., at its Medal Day exercises at Philadelphia, Pa., on May 15. The award was made to Mr. Templin "in consideration of the ingenious application of mechanisms resulting in the development of the Templin automatic autographic deformation recorder."

Pullman Develops Triple-Deck Coach-Sleeper

Two triple-deck coach-sleepers, developed by the Pullman Company as an appeal to "economical travelers who want a real sleeping service at minimum charges for both transportation and the reserved accommodation," will be placed in experimental service during June and will be tried out on several railroads in various sections of the country.

Each car has 10 compartments located on one side. Five have seating and sleeping accommodations for three persons each and the remainder accommodate six persons each, or a total of 45 persons per car. The larger compartments have the same facilities as the smaller being, in effect, two three-person compartments with three seats on each side, facing each other, and no separating partitions.

During day travel, passengers occupy upholstered seats, adjustable as to the slope of the backs and the height of the seat. Arm rests separate the three seats in each unit, and at night the two arm rests are folded into the seat. Individual foot rests aid comfortable day lounging.

The berths are in three tiers. The lower is formed by the seat back, similar to the bedroom couch bed. The upper berth is stationary, the bottom being well above the head of a tall person. The second, or intermediate, berth is a new development. It is raised against the upper during the day, and at night is lowered midway between the upper and lower, and forms a partition between compartments.

Each berth has individual curtains; also a shelf and a hammock for clothing and other belongings. A ladder is so placed that occupants of the two higher berths may ascend or descend without disturbing their compartment neighbors.

At the window end of each compartment are a wash basin, hot and cold water, a dental faucet, a mirror adequately lighted for toilet purposes and an electric shaving outlet. The basin folds closely to the car's

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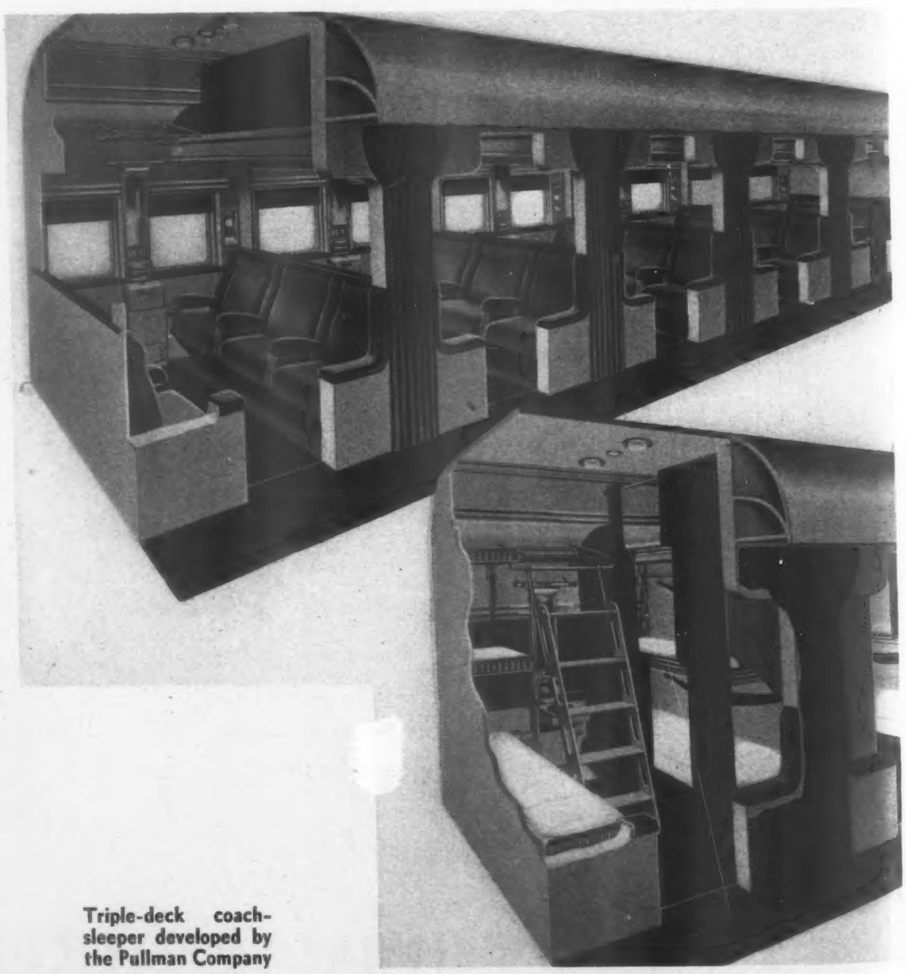

Triple-deck coach-sleeper developed by the Pullman Company

outer wall and is locked in position. In addition to these facilities there are washrooms and toilets for men and women, at opposite ends of the car. A baggage compartment gives extra luggage space.

Aisle curtains will be drawn across compartment entrances during dressing periods. At night, when all passengers have retired, these curtains can be drawn back, as in daytime, for circulation of air.

Folding seats are placed along the aisle wall of the car opposite each compartment entrance, for the convenience of those awaiting the making or putting away of the berths. The coach-sleepers are air-conditioned, and at night each berth has a fresh-air inlet, individually controlled. The lighting system illuminates each seat, and there is a reading lamp in each berth. Attractive colors and fabrics are used in the decorations.

Franklin Institute Honors Union Carbide Research Head

Dr. Frederick Mark Becket, president, Union Carbide & Carbon Research Laboratories, Inc., New York, was the recipient of the Elliott Cresson Medal awarded by the Franklin Institute on May 15 at its Medal Day exercises at Philadelphia, Pa. This medal, awarded for distinguished contributions in the realm of physical science, was given to Dr. Becket "in consideration of his outstanding achievements in the development of processes for the production of low-carbon ferro alloys, which have led to the wide use of many of the now well-known alloy steels, particularly low-carbon stainless steels, and the higher chromium oxidation-resistant steels; and also for his many inventions and contributions in the field of electrometallurgy."

Microfilm Copies Available at Engineers' Library

The Engineering Societies Library, 29 West Thirty-ninth street, New York, has broadened its services to engineers by making available at cost "microfilm" copies of the material contained in the 160,000 volumes and thousands of periodicals in its collection. Any engineer, library or company in any part of the world may order microfilm copies on 35-mm film at the cost of four cents per exposure with a minimum charge of $1.25 per volume, postage included. This service is in addition to that already available for supplying photostat prints at 30 cents each.

The Engineering Societies Library is a joint co-operative enterprise of the American Society of Civil Engineers, the American Institute of Mining & Metallurgical Engineers. The American Society of Mechanical Engineers, and the American Institute of Electrical Engineers.

Equipment Purchasing and Modernization Programs

New York Central.—The New York Central has asked authority from the Interstate Commerce Commission to assume liability for $10,400,000 of two per cent equipment trust certificates, maturing in equal annual installments on June 1, 1941, and on June 1 of each year thereafter to and including June 1, 1950. The proceeds will constitute 90 per cent of the purchase price of equipment costing $11,571,100, consisting of 25 L-3-B Mohawk freight locomotives, 25 L-3-A Mohawk freight and emergency passenger locomotives, 1,500 55-ton all-steel self-clearing hopper cars, 500 70-ton all-steel bulk cement covered hopper cars, and one stainless-steel passenger coach.

Educational Program for Turret-Lathe Operators

An educational program designed to aid in the training of apprentices and to help the experienced operators of the country's 55,000 turret lathes improve their skill has been announced by The Warner & Swasey Company, Cleveland, Ohio.

A "Turret-Lathe Operators Service Bureau" has been established, as announced by Clifford S. Stilwell, executive vice-president, and is designed to help the machine-tool-using industries solve the production problems which the lack of skilled mechanics creates every time operations reach a high level. The new service bureau will get under way immediately with a three-point program.

The bureau will send lecturers into manufacturing plants all over the country with sound slide films, charts and models, to show operators the modern and improved operating techniques of utilizing turret lathes and tooling equipment. A 240-page text book published by the Bureau will give operators an opportunity to improve their technique through home study. A monthly publication called "Blue Chips" will serve as the third arm of the program, affording opportunity for exchanging ideas and keeping operators posted on latest developments in their field.

Bureau lecturers will be available to visit technical high schools and colleges, as well as industrial plants. The program of instruction is introduced with the 20-min. slide film which emphasizes, among other things, the importance of further study and education. The lecture itself is built around ten fundamental principles of turret-lathe operation and is illustrated with drawings enlivened with cartoon characters.

The 240-page text book is devoted entirely to turret-lathe operation. It contains over 367 illustrations and complete charts and tables. The book is available to operators at a nominal price of $1.00 and to the general public at $2.50 per copy.

Blue Chips, the monthly publication, contains, for the most part, answers to questions sent in by operators, and tooling ideas and short-cuts which operators themselves have developed. Contributors are paid $3.00 for each idea printed.

Safety Vents on Sulphuric-Acid Tank Cars

The Interstate Commerce Commission, by Commissioner Alldredge, has issued another of the Special Series A orders in the No. 3666 proceeding involving regulations for the transportation of explosives and other dangerous articles, granting an application filed by the Mechanical Division, Association of American Railroads, on behalf of the Manufacturing Chemists' Association for authority to install on 100 tank cars safety vents equipped with lead discs having 1/16 in. breather holes in the center. The cars thus equipped will be allocated for test purposes to shippers of sulphuric acid.

Orders and Inquiries for New Equipment Placed Since the Closing of the May Issue

Locomotive Orders

Road	No. of Locos.	Type of Locos.	Builder
Chicago, Rock Island & Pacific	1[1]	1,000-hp. Diesel-elec.	American Loco. Co.
Terminal R. R. Assn. of St. Louis	2	1,000-hp. Diesel-elec.	Electro-Motive Corp.
	4	600-hp. Diesel-elec.	Electro-Motive Corp.
	2	660-hp. Diesel-elec.	American Loco. Co.
	2	660-hp. Diesel-elec.	Baldwin Loco. Wks.

Locomotive Inquiries

Road	No. of Locos.	Type of Locos.	Builder
Detroit, Toledo & Ironton	4 or 7	2-8-2 or 2-8-4	....
Western Maryland	12	4-6-6-4	....

Freight-Car Orders

Road	No. of Cars	Type of Car	Builder
Chesapeake & Ohio	100	50-ton flat	Pullman-Std. Car Mfg. Co.
Cincinnati, New Orleans & Texas Pacific	75	70-ton hopper	Pullman-Std. Car Mfg. Co.
Great Northern	1,000	50-ton box	Pullman-Std. Car Mfg. Co.
Nashville, Chattanooga & St. Louis	50	70-ton hopper	Pullman-Std. Car Mfg. Co.
Tennessee Coal, Iron & R. R. Co.	16	70-ton air dump	Pressed Steel Car. Co.

Freight-Car Inquiries

Road	No. of Cars	Type of Car	Builder
Great Northern	1,000	50-ton box	....

Passenger-Car Orders

Road	No. of Cars	Type of Car	Builder
New York Central	1	Stainless-steel Passenger coach	Edw. G. Budd Mfg. Co.
Canadian Pacific		See footnote[2]	
Western Rwy. of Alabama	2	Baggage-express	....

[1] Delivery accepted.

[2] The Canadian Pacific is asking for prices on the construction of frames for 25 passenger coaches, on which interior work will be carried out in the company's own shops at Montreal, Que. The cars are to be air conditioned and have an overall length of 83 ft. 10½ in. between the coupler buckles and will have a clear inside length of 77 ft. 3½ in. The inside layout provides toilet rooms and drinking fountains at each end of the car, and the passenger space will be divided into two compartments—a smoking space seating 16, divided by a glass partition from the main portion of the car which provides seats for 56 passengers.

Supply Trade Notes

C. D. Allen, eastern sales manager of The J. S. Coffin, Jr., Company, Englewood, N. J., has ben appointed vice-president.

◆

William Taggart, representative of the Steel & Tube division of the Timken Roller Bearing Company, Canton, Ohio, has been appointed manager of tube sales.

◆

C. B. Boyne, manager of stainless bar and wire sales of the Allegheny Ludlum Steel Corporation, Pittsburgh, Pa., has been appointed manager of stainless sales, with headquarters at Pittsburgh.

◆

W. A. Blume, vice-president of the American Brakeblok division of the American Brake Shoe & Foundry Company, has been elected president of the American Brakeblok Division with headquarters at Detroit, Mich.

◆

S. W. Gibbs, assistant sales manager of the materials handling division of the Yale & Towne Manufacturing Co., at Philadelphia, Pa., has been appointed general sales manager of the Philadelphia division.

◆

Edward L. Ryerson, Jr., vice-chairman of the board of the Inland Steel Company, Chicago, has been elected chairman to succeed L. E. Block, who has retired. Mr. Block has been elected chairman of the executive committee.

◆

Norman L. Deuble is now associated with the Copperweld Steel Company, at Warren, Ohio, as assistant to vice-president. Mr. Deuble was previously with the Republic Steel Corporation and had been associated with the Central Alloy Company and the United Alloy Steel Co.

◆

George A. Blackmore has been elected chairman of the board of the Duff-Norton Manufacturing Company, Pittsburgh, Pa., succeeding the late Thomas A. McGinley. Mr. Blackmore is president and director of the Westinghouse Air Brake Company, the Union Switch & Signal Co.; a director of the A. M. Byers Company, the Pittsburgh Screw & Bolt Corp., the Pittsburgh Coal Company, the Flannery Bolt Company, the Bendix-Westinghouse Automotive Brake Company, the Cardwell Westinghouse Company, the Westinghouse Brake & Signal Co., Ltd. of London, the Canadian-Westinghouse Company of Hamilton, Ont., the Westinghouse Electric & Manufacturing Company, the Mellon National Bank, the National Association of Manufacturers, and the Chamber of Commerce of Pittsburgh.

Obituary

Charles H. Johnson, executive vice-president and director of the Gisholt Machine Company, Madison, Wis., died on April 23 at the age of 58 years.

◆

Walter S. Rugg, who retired in May, 1936, as vice-president of the Westinghouse Electric & Manufacturing Co., died on April 25, in New York, at the age of 74 years.

◆

George Lewis Bourne, chairman of the board, The Superheater Company, and its affiliated Combustion Engineering Company, Inc., of New York, died on May 25, at his home in Larchmont, N. Y., at the age of 66. Mr. Bourne had been ill for several months.

◆

Paul Wyler, formerly district manager of the Franklin Railway Supply Company, New York, for about 28 years previous to 1934, died on April 7, at his home in Dunkirk, N. Y. Mr. Wyler was a graduate of Purdue University. He served in the engineering department of Chicago, Rock Island & Pacific and was subsequently employed by the Bettendorf Company. He entered the service of the Franklin Railway Supply Company about 1906.

◆

Arthur G. Hollingshead, whose death on April 23 at Chicago was announced in the May *Railway Mechanical Engineer*, was born at Zanesville, Ohio, on August 8, 1862. He entered railroad service at the Fort Wayne shops of the Wabash, and, after completing his boiler maker apprenticeship, became a locomotive fireman and engineman. He served as enginehouse foreman at several points on the Wabash and in 1892 was promoted to division master mechanic, with headquarters at Hudson, Ind. In 1896, he entered the supply business with the Scully Steel & Iron Company. Subsequently he was employed by the Philadelphia Pneumatic Tool Company, the Murphy Car Roof Company and the Ralston Steel Car Company. In 1905, he entered business for himself and formed the Okadee Company. He expanded his interests in 1913 by affiliating with Harry Vissering & Company, Chicago, now the Viloco Railway Equipment Company, and the Charles R. Long, Jr., Company of Louisville, Ky. From 1929 until his death he was actively engaged as president of The Okadee Company and the Viloco Railway Equipment Company, both of Chicago, and the Viloco Machine Company of Benton Harbor, Mich.

Arthur G. Hollingshead

◆

Thomas A. McGinley, president and chairman of the board of the Duff-Norton Manufacturing Company, Pittsburgh, Pa., died on April 13. Mr. McGinley was graduated from Yale University in 1901. Soon afterward he entered the employ of the Duff Manufacturing Company, and worked through its various departments up to the presidency and board chairmanship of its successor organization, The Duff - Norton Manufacturing Company. During his early manhood he, with his father, was interested in several of George Westinghouse's enterprises, and at his death Mr. McGinley was a director of the Westinghouse Air Brake Company and the Union Switch and Signal Company, as well as numerous other concerns, including the Pittsburgh Screw and Bolt Company, the Fidelity Trust Company and the Allegheny General Hospital. Mr. McGinley was treasurer of the Eaglis Company. During the World War, he served in New York as district manager in charge of aircraft production for the United States Army.

Blank & Stoller

Thomas A. McGinley

◆

Hugh A. Gillies, vice-president of the American Brakeblok division of the American Brake Shoe & Foundry Co., died of a cerebral hemorrhage at the Commodore Hotel, New York, on April 23, while on a business trip from his home in Detroit, Mich. Mr. Gillies was born at McComb City, Miss., in 1881. He started his business career as a machinist and mechanical engineer and served on a number of railroads in the United States and Mexico. He joined the American Brake Shoe Company in 1915, and was placed in charge of the company's Denver, Colo., plant and the sale of its products. When a new division was organized to manufacture automotive brake lining, Mr. Gillies was put in charge of sales.

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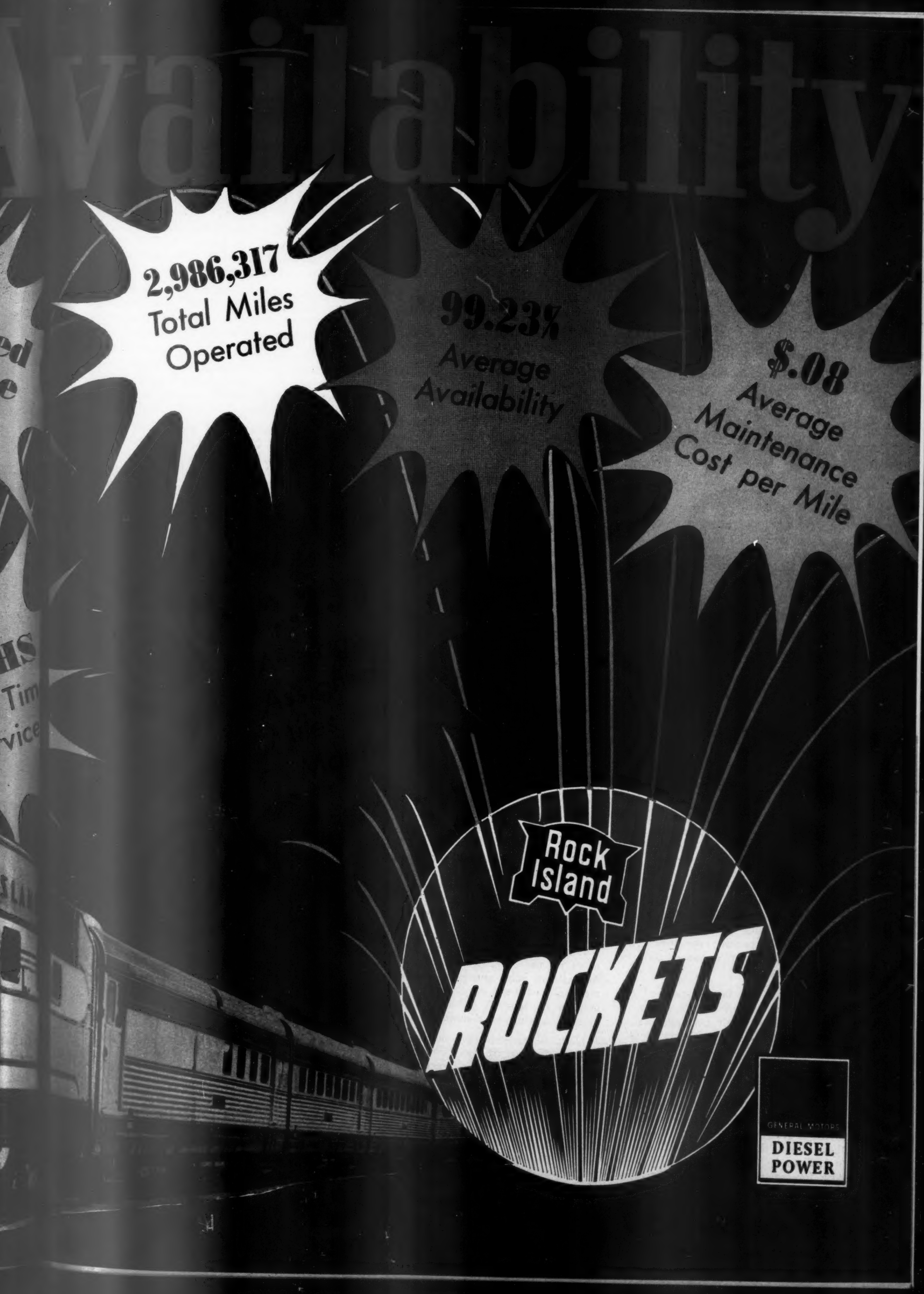
Six Rockets Make Records

The Rock Island's fleet of six smartly styled stainless steel streamlined "Rockets" has established an enviable performance record with the utmost in safety, comfort and economy.

The six "Rocket" locomotives, built by Electro-Motive Corporation and each powered by one General Motors 1200 horsepower two-cycle Diesel engine, entered service in the fall of 1937. The records shown are from the date of installation to January 1, 1940.

Entered Service in Fall of 1937

28 MONTHS Average Tim in Servic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Rock
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ROCKETS
GENERAL MOTORS
DIESEL
POWER

Personal Mention

General

John Zweifel, assistant mechanical and electrical engineer of the New York Central, with headquarters in New York, has retired after almost 34 years of service.

G. A. Clarke, supervisor of auxiliary equipment on the New York, New Haven & Hartford, has been promoted to chief mechanical inspector at New Haven, Conn. Mr. Clarke entered the employ of the New Haven in 1923 as a material inspector and in 1928 became assistant to the mechanical engineer. From 1930 to 1936 he was assistant engineer of power plants and then became supervisor of auxiliary equipment.

Elwood R. Buck, who has been appointed superintendent of motive power of the Wabash, with headquarters at Decatur, Ill., as announced in the May issue, was born on December 2, 1894, at Altoona, Pa., and was educated at Pennsylvania State College. He entered railway service on the Pennsylvania on June 26, 1913, and completed a special apprenticeship in 1920. On April 1, 1923, he was promoted to assistant master mechanic of the Trenton division, and on January 1, 1931, was transferred to the Baltimore division. He served also at other points on the Pennsylvania as assistant master mechanic and was master mechanic at Pitcairn, Pa., at the time of his recent appointment as superintendent of motive power of the Wabash at Decatur.

Elwood R. Buck

Philip Baker has been appointed assistant superintendent of motive power of the Lehigh Valley, with headquarters at Sayre, Pa. Mr. Baker was born on October 3, 1890, at Nashville, Tenn., and entered railway service in February, 1907, with the Nashville, Chattanooga & St. Louis as a machinist apprentice. He served as machinist on the Nashville, Chattanooga & St. Louis; St. Louis & San Francisco; Louisville & Nashville; Tennessee Central; Southern; and the Florida East Coast. From 1927 to 1934 he served the Wabash as gang foreman; assistant machine foreman; and assistant master mechanic. In March, 1934, Mr. Baker was appointed general foreman of the Belt Railway of Chicago, subsequently becoming master mechanic, in which capacity he served until his recent appointment on the Lehigh Valley.

Master Mechanics and Road Foreman

Mark P. Smith, assistant road foreman of engines of the Scioto division of the Norfolk & Western at Portsmouth, Ohio, has retired.

T. L. Preun, foreman at the Hoboken shop of the Pennsylvania, has been appointed assistant master mechanic of the Philadelphia division.

C. A. Wilson, master mechanic of the Williamsport division of the Pennsylvania at Renovo, Pa., has been transferred to the Middle division with headquarters at East Altoona, Pa., succeeding J. L. Marks.

W. R. Jackson, assistant road foreman of engines on the Radford division of the Norfolk and Western, has been transferred to the Scioto division, with headquarters at Portsmouth, Ohio, succeeding Mark P. Smith, retired.

W. A. Noell, passenger equipment inspector of the Norfolk and Western at Roanoke, Va., has been appointed assistant road foreman of engines, with headquarters at Roanoke, succeeding W. R. Jackson.

H. C. Wright, assistant master mechanic of the Philadelphia division of the Pennsylvania, has been appointed master mechanic of the Williamsport division, with headquarters at Renovo, Pa., succeeding C. A. Wilson.

G. M. Lawler, master mechanic on the Atchison, Topeka & Santa Fe at Dodge City, Kan., has had his headquarters transferred to LaJunta, Colo. His jurisdiction now includes the enginehouse, locomotive and car departments at LaJunta.

W. C. Smith, assistant master mechanic of the New Haven division of the New York, New Haven & Hartford with headquarters at New Haven, Conn., has been appointed master mechanic, with the same headquarters.

Harry E. Mills, road foreman of engines on the Northern Pacific at Duluth, Minn., has been appointed acting master mechanic, with the same headquarters, succeeding Norman P. White, who has been granted a leave of absence.

J. L. Marks, master mechanic of the Middle division of the Pennsylvania, has been appointed master mechanic of the Pittsburgh, Conemaugh and Monongahela divisions, succeeding E. R. Buck.

R. V. K. Jennings, general foreman at the Maybrook (N. Y.) enginehouse, of the New York, New Haven & Hartford, has been appointed assistant master mechanic with headquarters at New Haven, Conn.

Shop and Enginehouse

John O. Rose, night enginehouse foreman on the Louisville & Nashville at Corbin, Ky., has become day enginehouse foreman at Corbin.

David G. Root, gang foreman in the backshops of the Louisville & Nashville at Corbin, Ky., has become night enginehouse foreman, succeeding John O. Rose.

C. P. Brooks, supervisor of apprentices of the Erie at Cleveland, Ohio, has been promoted to general foreman, locomotive department, at Marion, Ohio.

William Jasper Young, machine shop foreman on the Louisville & Nashville at Corbin, Ky., has been promoted to the newly created position of foreman of erecting and machine shop at Corbin

F. Whitaker, chief mechanical inspector on the New York, New Haven & Hartford at New Haven, Conn., has been promoted to the position of assistant superintendent of the Readville (Mass.) shops. Mr. Whitaker entered the employ of the New Haven in 1914 as a draftsman in the mechanical department at New Haven. In 1919 he became valuation inspector and in 1932 was appointed foreman mechanical inspector at Readville shops. In 1939 he was appointed chief mechanical inspector.

Car Department

H. H. Zerbach, foreman of the car department at the Emerson shops of the Atlantic Coast Line at Rocky Mount, N. C., has been appointed general foreman.

J. Lee Harrison, foreman in the car shops of the Atlantic Coast Line at Jacksonville, Fla., has been appointed foreman, car department, Emerson shops, Rocky Mount, N. C., succeeding H. H. Zerbach.

Obituary

John L. Brady, foreman of the car department of the Louisville & Nashville at DeCoursey, Ky., died on March 29.

Arthur G. Phillips, superintendent of machinery and tools of the Delaware, Lackawanna & Western at Scranton, Pa., died in that city on May 7.

Samuel Russell, assistant to the general master mechanic of the Boston & Albany, at West Springfield, Mass., died at the age of 67 at his home in Springfield, Mass. Mr. Russell was born at Ghent, N. Y., on March 13, 1873. He began his railway career on the B. & A. on July 20, 1899, as a locomotive fireman. On January 15, 1903, he became an engineman and on October 10, 1910, was promoted to the position of road foreman of engines, with headquarters at Albany, N. Y. On January 1, 1924, Mr. Russell was appointed division master mechanic with headquarters at West Springfield, Mass., and on October 1, 1938, he became assistant to the general master mechanic. He was a member of the New England Railroad Club and an organizer and past president of the B. & A. Supervisors' club.